

SPURRING INNOVATION AND JOB CREATION: THE SBIR PROGRAM

HEARING BEFORE THE COMMITTEE ON SMALL BUSINESS UNITED STATES HOUSE OF REPRESENTATIVES ONE HUNDRED TWELFTH CONGRESS FIRST SESSION

HEARING HELD
MARCH 16, 2011



Small Business Committee Document Number 112-06
Available via the GPO Website: www.fdsys.gov

U.S. GOVERNMENT PRINTING OFFICE

65-651

WASHINGTON : 2011

For sale by the Superintendent of Documents, U.S. Government Printing Office
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SPURRING INNOVATION AND JOB CREATION: THE SBIR PROGRAM

WEDNESDAY, MARCH 16, 2011

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The Committee met, pursuant to call, at 1:00 p.m., in Room 2360, Rayburn House Office Building. Hon. Sam Graves (chairman of the Committee) presiding.

Present: Representatives Graves, Bartlett, Herrera Beutler, West, Barletta, Velázquez, Critz, Altmire, Clarke, Chu, Richmond, Peters, Owens, and Keating.

Chairman GRAVES. Good afternoon. And we will call this hearing to order. We are going to have a series of votes called sometime in the next I would say half hour probably. And so when that happens we are going to go through the ranking member and I's opening statements and then we will try to get through as many opening statements as we can. And then we will have a recess and then we will come back to work through the process. But I want to thank everybody for being here today and for being a part of this hearing which begins our work to reauthorize the Small Business Innovative Research program and the Small Business Technology Transfer programs.

I would, specifically, again, I would like to thank all of you for coming out. Some of you came from quite a distance and I appreciate you taking the time to be able to come and speak to us.

This hearing represents the beginning of our work to reauthorize the SBIR program which was last fully reauthorized in 2000. Today we are going to broadly examine and stress the importance of the SBIR program and take a closer look at how we can work to jumpstart entrepreneurs and grow our economy and create jobs. The SBIR program was created in 1982 and offers competition-based awards to stimulate innovation among small, private-sector businesses while providing government agencies new, cost-effective and technical solutions to meet their varied mission requirements.

The development of this program is not only significant to the unique needs of each of the participating federal agencies but also to our national economy. Small businesses renew the U.S. economy by introducing new products and cheaper ways of doing business, often with substantial economic benefits. They play a key role in introducing technologies to the market and responding quickly to new market opportunities. Some of the great innovations and the companies that have created them came from the industrious en-

trepreneurs willing to take a risk on new technologies and discoveries.

In 2007, the National Research Council of the National Academies of Science completed one of, if not the most comprehensive examination of the SBIR program. The study found that the SBIR program provides substantial benefits for participating small businesses at all agencies in a number of different ways. For example, the SBIR program is a significant factor in the funding of new companies, providing partnering and networking opportunities, and providing the impetus to start projects that otherwise would have never gotten off the ground.

In terms of job creation, the NRC Survey sought detailed information about the number of employees at the time of the award and at the time of the survey, and about the direct impact of the award on employment. And overall, the survey respondents reported a gain of 57,808 full-time equivalent employees. Respondents estimated that, specifically as a result of the SBIR project, their firm was able to hire an average of 2.4 employees and retain 2.1 more.

The SBIR program, as the National Research Council Study demonstrates, also provides significant benefits to federal agencies to provide additional opportunities to solve operational needs. A program officer can post a solicitation that describes a particular problem and invite a small business to propose research that will solve it. This contrasts with other federal research awards where a researcher provides a proposal of personal interest. The nationwide scope of the program also ensures that the agency will investigate various research avenues. Finally, the program, by leading to commercialization of the research, diversifies the federal government's industrial base providing competition among suppliers and lowering prices to the government, which saves taxpayers' dollars.

I am looking forward to the testimony today and I will yield to the ranking member for her opening statement.

Ms. VELAZQUEZ. Thank you, Chairman Graves.

The development of life's changing products from cancer-fighting drugs to advanced electronics drives our nation's economy. However, without adequate funding for research and development, small businesses cannot expand and even the best ideas wither and die in what has come to be known as the valley of death between startup and commercialization.

Congress established the Small Business Innovation Research program with the intent of funding small, innovative companies conducting research and development with commercial potential. Since the first grants were awarded in 1983, more than 24 billion dollars has been awarded to small research companies funding in excess of 100,000 projects.

In fiscal year 2009, the SBIR program made over 6,400 awards totaling \$2.5 billion, an all-time high. By all measures the SBIR program is among the federal government's largest research and development programs. The public-private partnerships that SBIR awards facilitate encourage entrepreneurs to start new business and enable existing businesses to expand their operations. SBIR awards spirit and innovation and create and retain jobs in all 50 states, the District of Columbia, and Puerto Rico.

According to the National Academies of Science Survey, over 20 percent of applicants who open a new business often receive an SBIR award. This translates to nearly 1,500 new businesses each year and an estimated 80,000 jobs created over the next decade. While SBIR awards provide small businesses with some research funding, most high-tech and pharmaceutical firms need resources beyond what is available through SBIR to take their ideas from the drawing board to the marketplace.

If firms are ever going to reach their full potential, the gaps between what SBIR provides and what is needed to develop a product must be addressed. This is hindering promising researchers and entrepreneurs from commercializing their discoveries. To help foster innovation and bring life changing products to market, SBIR programs should be available to all firms without barriers or cost prohibitive regulations. Review of the SBIR program shows that it has succeeded in funding high quality research encouraging competition and increasing successful commercialization. However, areas of witness have been identified particularly with lax oversight which help lead to waste, fraud, and abuse of the program. Most troubling are findings of duplicative awards of agencies for the same research and the serial funding of firms that continually fail to produce marketable technologies. Such examples of fraud have become a serious problem, especially with increasing numbers of proposals submitted to the SBIR program. It is critical that we bolster oversight and curb the waste, fraud, and abuse that prevent SBIR and STTR programs from functioning as intended.

In advance of the testimony, I want to thank all the witnesses who have traveled here for your participation and insight into this important program. Thank you.

And I yield back.

Chairman GRAVES. Just to explain real quick about how the process works, you have a series of lights in front of you and you each have five minutes. Please try to stay within that. If you go over nobody is going to break your arm or anything like that but the light will turn yellow when you have one minute left and it will go red when you go over your time. And then questions will go along the same lines. There will be five minutes for questions from each of the members.

STATEMENTS OF TOM TULLIE, CHIEF EXECUTIVE OFFICER, PRESIDENT AND CHAIRMAN OF ECOATM; DAVID B. AUDRETSCH, INDIANA UNIVERSITY; MICHAEL SQUILLANTE, VICE PRESIDENT OF RESEARCH, RADIATION MONITORING DEVICES; AMY COMSTOCK RICK, CHIEF EXECUTIVE OFFICER, PARKINSON'S ACTION NETWORK

We will start off with Mr. Tom Tullie. Mr. Tullie is the chairman and CEO of EcoATM. His company is the first and only company to create an automated, self-serve kiosk system that uses patented advance machine vision, electronic diagnostics, and artificial intelligence to evaluate and buy back used electronics directly from the consumer. He has 23 years of experience in semiconductor systems in computing and software. Mr. Tullie, welcome to the Small Business Committee and I look forward to hearing your testimony.

STATEMENT OF TOM TULLIE

Mr. TULLIE. Good afternoon. Thank you, Chairman Graves, Ranking Member Velázquez, and members of the committee.

It is an honor to appear before the House Committee on Small Business today to testify about the role that the SBIR program has played in EcoATM's success to date. As Chairman Graves has said, I am Tom Tullie. I am chairman and CEO of EcoATM. I would like to commend all of you for your role in pursuing successful policies that have strengthened companies, created jobs, and fostered innovation in the U.S.

As I will discuss further in my testimony, the SBIR program is among the critical factors that are contributing to our success, and these factors that are taking us from a small start up to a full-fledged corporate taxpayer.

EcoATM was funded with a vision to forever alter the wasteful lifecycle of consumer electronics. With electronics recycling rates at less than 10 percent, we believe that to achieve this bold vision we would have to create a recycling solution that guaranteed convenience, low transactional cost, and immediate remuneration. To execute this vision we developed the world's first fully automated, self-serve machine that buys back used electronics. It automatically identifies, inspects, calculates the value, and pays the consumer on the spot. Our initial trials just in the first year of our operation with only 10 machines have certainly validated the strategy as we have collected over 50,000 different devices and paid consumers hundreds of thousands of dollars that they ordinarily would not have had.

To illustrate the scale of the opportunity as well as the problem let me tell you a couple of numbers about the mobile phone business. Collectively across America, in our drawers and closets there are over a billion cell phones. These phones have a latent value of about \$12 billion if we could collect and recycle them. In addition, 150 million new devices every year are retired with a value of \$5 to \$7 billion dollars. This is free money that can go into our economy. If we can simply collect these devices, we can create a free multi-billion dollar stimulus package by turning people's trash into cash and reinvesting these free dollars back into the economy driving discretionary spending, job growth, and tax revenues.

In addition to the stimulus package value that we create, we also have a great environmental benefit. I am sure most people know that cell phones and other electronics contain toxic chemicals that are dangerous to our environment. Currently there are 75,000 tons of e-waste that get put into our landfills every year. We estimate that just a single EcoATM kiosk would divert 25,000 tons of toxic mining waste, offset 4,300 kilograms of greenhouse gases, save 426 gallons of oil with the equivalent of removing 21 houses from the grid or 3 automobiles off the road.

We have been very fortunate to receive a phase one NSF grant of \$150,000. This grant partially funded the development of our advanced vision and electrical test systems. The vision system is now capable of identifying over 1,000 different mobile phones with error rates of less than one percent. Interestingly, the NSF has helped in a variety of different fronts as our key visions systems engineer

actually was put through grad school on a fellowship from the NSF Graduate Research Fellowship program.

Right now we are in the phase of applying for a phase two grant. This grant would allow us to fully commercialize our system, as well as expand the vision and electrical technology to add other devices other than cell phones such as laptops, digital cameras, GPS devices, et cetera. Additionally, a phase two award would allow us to explore the development of a standard process for the erasure of personal data on these devices and make it much easier to get that done.

I understand the Committee is in the process of evaluating the SBIR programs and recommending some changes to the policies, especially as they relate to venture back companies. I believe these changes should be centered on allowing the agencies to pick companies that deliver the best return for the taxpayer. To do so I would encourage legislation that gives the agencies enough freedom to pick and stay with the winners throughout the process. I suggest partnering with the VC community, not abandoning the companies that have received venture funding. This should help the SBIR select good companies that are more likely to excel. Early stage companies are all about momentum. So if the SBIR has picked a winner it should foster that company through its early years and stay with it to make the possibility of a great return all that more likely. I also suggest enhancing the criteria and searching for winners by funding companies that can not only generate great commercial success but public and environmental benefits as well.

Businesses that excel in all these three areas should generate a better total return and EcoATM is an example of one of these businesses that has this triple bottom line.

I hope my testimony was helpful and will play a role in convincing the Committee and the rest of the House of Representatives that our agency should be given the freedom to pick the winners in order to deliver the maximum return to our taxpayers. Thank you again for the opportunity to appear before the Committee and I look forward to your questions.

[The statement of Mr. Tullie follows:]

Statement by

Tom Tullie
Chairman and CEO
ecoATM Inc.

Prepared for the hearing on
“Spurring Innovation and Job Creation: The SBIR Program”

Before the
U.S. House of Representatives
Committee on Small Business

March 16, 2011 1:00 p.m.

Introduction

Good afternoon Chairman Graves and Ranking Member Velazquez and Members of the Committee. It is an honor to appear before the House Committee on Small Business today to testify about the role that the Small Business Innovation Research (SBIR) program has played in ecoATM's success.

My name is Tom Tullie, and I am the Chairman and CEO of ecoATM. I have served in this capacity since December 2009. You are to be commended for your role in pursuing successful policies that have strengthened innovation, created jobs, and fostered innovation in the U.S. The SBIR program is one such example. As I will discuss further in my testimony, the SBIR program is among the critical factors that are contributing to ecoATM's early success – those factors that are currently taking us from a small startup to a full fledged corporation, on the verge of forever altering the wasteful lifecycle of consumer electronics in this country.

Earlier this month ecoATM was honored at the DEMO Conference for emerging technologies as one of the 6 most promising business's showcased. A few months earlier we were honored at the CES world trade show with an award for the most innovative technology, and just a short time before that we where honored by Popular Science as one of the best new companies in the US. In 2009 we were named the Most Innovative Product in the Cleantech category by CONNECT. The CONNECT Most Innovative Product Awards are San Diego's "Oscars" for regional tech innovation.
(www.connect.org)

The SBIR program was and continues to be important to our success. We applaud the Committee for holding this hearing today to learn about ways in which the SBIR

program can be strengthened and renewed to ensure that other future success stories are possible for the benefit of the American people.

ecoATM Overview Today

Based in San Diego, California, ecoATM (www.ecoatm.com) is the first company to create an automated, self-serve kiosk system that uses patented, advanced machine vision, electronic diagnostics, and artificial intelligence to evaluate and buy-back used electronics directly from consumers for cash or store credit. ecoATM's eCycling stations provide a convenient buy-back and trade-in solution that:

- electronically and/or visually inspect virtually any consumer electronic device,
- connects consumers in real-time with a broad worldwide secondary market to ensure best pricing, and
- pays consumers immediately in cash and/or store credit, and
- automatically administers trade-in / trade-up promotions for retailers and manufacturers.

In its infancy, ecoATM was supported by EvoNexus, the incubator for early-stage high-tech companies, begun by San Diego's high tech industry group, CommNexus. Since then, ecoATM has been recognized by Popular Science, International Electronics Recycling Conference & Expo (IERCE), Green:Net, CES Innovations, and others. (www.ecoatm.com/about-awards.htm)

ecoATM was founded in 2008 with a vision of forever altering the path of consumer electronics in the United States and abroad. Today, following through on that vision, ecoATM has turned to technology itself as seen in the creation of the first fully automated self serve e-cycling station, the ecoATM. The ecoATM was conceived based on the core assumptions that convenience and immediate financial incentive would dramatically increase consumer recycling rates. Turns out this core assumption is true. In less than a year with only 10 machines, ecoATM has harvested over 50,000 mobile phones and paid out over \$600k to customers. But before I delve into our success any further, let me shed some light on the current world wide e-waste problem.

Identification and Significance of the Opportunity

As the growth of wireless communications continues and constant innovation ushers in new-generation technologies with new and expanded features, the last few years have seen a relentless flow of retired mobile phones that are being displaced by new purchases. Greater than 80% of new phone sales replace an existing handset. Unfortunately, only a relatively small percentage of these displaced phones find their way into recycling channels.

In the United States alone, an estimated one billion used phones already sit in drawers, with more than 150 million newly-retired phones joining them every year. *The current drawer-bound cache of 1 billion phones has an estimated total value of \$12.2 billion if they were to be recycled.* Recently displaced handsets that are less than 2 years old retain an average value of \$18 each at collection and before any refurbishment. Upon

refurbishment, the average value jumps to well over \$50. Phones that make up the next category generally are over 2 years old and still retain a vibrant aftermarket. These phones yield an average \$2 value at collection and over \$25 average value after refurbishment. The remaining phones are generally considered “end of life” and are worth roughly \$.65 per phone when smelted down to reclaim precious metals.

On the other end of the recycling equation, the demand for refurbished mobile phones continues to rapidly accelerate, due largely to the explosive growth of wireless markets within developing countries. The number of subscribers in emerging markets is projected to surpass those in existing markets during 2010 and to continue accelerating over the next five years.

This widespread expansion in the market is due largely to the fact that many developing countries do not have extensive legacy investments in wireline-based communications and therefore are moving directly to wireless systems to meet their citizens’ emerging communications requirements. However, with approximately 90 percent of the populace in these developing countries living on \$3 or less per day, the cost of a mobile handset is a major consideration. In fact, the investment in a mobile handset for many buyers in developing countries can be comparable to the purchase of an automobile for buyers in developed countries.

Today, in India alone, a market of over 1 billion potential subscribers with a current 40% penetration rate, as many as 15 million mobile subscribers earning less than \$1,000 per year are being added to the mobile networks per month. As a result, *the cost-advantages of refurbished handsets present a significant ongoing, lasting value for a significant number of subscribers in these emerging markets.*

Another key factor in laying the groundwork of opportunity has been the evolution of mechanisms and channels for handling recycled mobile phones. A number of companies are OEM-certified and carrier-certified to perform complete software and hardware repair, and have already established solid industry reputations by helping to pioneer the ecosystem for efficiently refurbishing and redeploying displaced handsets back into the US and into emerging markets.

An equally important and quickly maturing aspect of this business is the collections of used phones from consumers. Methods vary from donation drop boxes, to e-waste drives, to mail-in programs, to point-of-sale buy-back systems.

Consumer electronics retailers are struggling to comply with growing federal, state, and local laws governing the “take-back” and recycling of the consumer electronics they sell. Eager to turn these cost-centers, take-back programs into profit centers and find a competitive advantage, many retailers have successfully embraced trade-in / trade-up incentive programs driving foot-traffic, revenue-lift, and sales of new devices through manual or POS-driven eCycling take-back systems. However, the labor and complexity of the “reverse-logistics” process to date has negated any potential profit gains and overwhelmed store staff and corporate logistics. *Therefore, consumer electronics retailers, OEMs, and wireless carriers are eager for a turn-key solution which complies with regulations, fully automates the take-back and reverse-logistics process, and manages the incentive rewards programs.*

In summation, we see a mounting cache of unused devices with value, while a

simultaneous and growing demand exists for these devices in emerging markets. The problem at hand is how to efficiently connect this growing supply with this growing demand and in the process keep this devices from becoming toxic eWaste in our landfills.

Environmental Threat

Many people may not realize that their cell and smartphones contain chemicals that pose a threat to humans and the environment if they are discarded and end up in landfills. Once in landfills, those chemicals will eventually seep into the water-table as a toxic stew. Each year, over 75,000 tons of cell/smartphones find their way to landfills. Additionally, in the making of just one phone, 3 tons of mining waste is generated. Thus, our activities protect the environment by keeping toxic waste out of landfills and maximizing legitimate product reuse, mitigating the need for additional resource mining. Our streamlined operations mean that we collect and move materials more efficiently than other systems, and we prove our beneficial impact on the environment every single day by measuring the removal of carbon and toxic waste from the environment.

The ecoATM Solution

The ecoATM has demonstrated a strong potential to bring **hundreds of millions** of dormant phones and other consumer electronics out of household drawers and into the recycling stream. ecoATM's self-serve Automated e-Cycling stations visually and electrically inspect used consumer electronics, and will allow consumers to receive immediate cash remuneration for their used electronics. We believe the ecoATM stations will become commonplace in electronic retailers over the next few years by allowing retailers to automatically monetize this supply of used devices and comply with evolving eWaste laws.

ecoATM and The SBIR Program

During its critical 2nd year, ecoATM received a Phase I SBIR grant that directly funded the development of our advanced vision and electrical test systems for the identification of electronic devices. The objective of the Phase I program is to experimentally verify that ecoATM's patented technology enables phones to be accurately inspected both visually and electronically by an ecoATM Automated eCycling Station. This provides the key factor that appeals to consumers (immediate financial incentive and convenience), plus important benefits to the retailers that host the ecoATM Automated eCycling Station (generating money to be spent in the store). ecoATM has made great strides with its visual and electrical test systems and continues to require funding and resources to further develop this critical piece of the ecoATM solution. The vision system is now capable of identifying over 1000 phone models with error rates in the fractions of a percent range.

The vision and electrical systems are the most resource and capital intensive component of the ecoATM kiosk and also the most important factor for an effective

kiosk. The vision system needs to not only identify the make and model of a device, but must be capable of evaluating the mechanical condition of the device, the condition of the screen, and ultimately determining the device's value.

After the benefits we received from the Phase 1 award, we are in the process of applying for a Phase 2 award. A Phase 2 SBIR grant would allow ecoATM to expand vision and electrical technology development to include additional device take-back categories including but not limited to, laptops, digital cameras, GPS systems, video games, e-readers, ink cartridges, printers, and PCs. Phase 2 would also bring even more precision to the vision component and further improve error rates and device identification and condition accuracy.

Additionally, Phase 2 funding would allow us to explore methods and apparatuses for the development of a standard process for the erasure of personal data from flash memory based devices, such as mobile phones, MP3 players and increasingly laptops, tablets, e-readers and other portable electronics. Lack of an industry standard for flash memory based device data erase has created a major impediment to consumers and enterprises to recycle these devices due to concern over personal or corporate data security. In fact, it's estimated that the US government alone has stashed tens of millions of used flashed based mobile phones locked in storage based on this concern, not to mention millions of other flash based device types.

SBIR, Start-Ups, and Venture Capital

SBIR funds should not be artificially prohibited or limited in relation to private investments. Venture capital does not artificially avoid investing in companies that receive SBIRs and the reverse should not be true because VCs and SBIR funds are aligned in their interest in spurring innovation and commercial success. The SBIR program is a great tool for start-ups to achieve financial support in a currently very difficult fundraising market which can often be the major barrier to commercial success. I would like to share with the committee my three main points related to the allocation and disbursement criteria of SBIR grants to venture capital backed companies:

VC's are good at picking technology and commercial winners

First, companies successful at raising capital through private sources or traditional VC's should not be precluded from receiving an SBIR grant. In fact, the achievement of VC funding should serve as an indicator for a strong possible SBIR grant candidate. VC's are very effective at their core competency, which is identifying technologies and companies with significant commercial potential. Grant money should be allocated where it has the best chance to add value, make a commercial impact, and make a return to the community. In this very important sense, the intent of VCs and the SBIR process are naturally aligned.

SBIRs create a catalyst for private investment

Secondly, when a small company such as ecoATM lands SBIR funds, this helps provide a critical catalyst for attracting private investment. It brings

credibility to the company and the technology which helps attract private investments from VC's for later rounds. Regardless if a company has raised money, the allocation of grant money can allow an already promising company to allocate additional capital for quicker development or direct capital to an ancillary piece of their business. And it also makes the overall economics more attractive for investors. I believe there is no reason for any rules to exist that force any artificial separation of government investments from private investments because both are aimed at achieving the same goal; providing capital to a deserving candidate with potential for success.

Criteria for allowing a grantee to receive both SBIR and VC monies should be based on broadened criteria and not artificially limited to 25% of total funds

Thirdly, the criteria should not be simplified to a binary issue of whether or not public and private investments are allowed or at a specific threshold of 25% or otherwise. A more meaningful and granular set of criteria would focus other criteria such as whether or not the investment has a public and/or environmental benefit (double bottom line and/or triple bottom line). A double bottom line is a business which not only demonstrates a strong financial bottom line but also provides a public benefit or bottom line. A triple bottom line would be a business that in addition to financial and public benefits, contains a 3rd benefit such as an environmental contribution. Investments that can demonstrate multiple bottom lines should be given special consideration for SBIR allocations and not be passed over because of a 25% or any other artificial threshold.

ecoATM is a great example of a business with a triple bottom line and there are many others. Aside from the financial viability of our business, we have demonstrated an impressive second bottom line in that it creates a large financial stimulus package for the public from devices that would otherwise become toxic eWaste in our landfills, and puts these used devices into the hands of people both foreign and domestic who may not be able to afford them otherwise. The 3rd bottom line for ecoATM is the environmental benefit which is substantial. In fact, after 1 year of 12 pilot kiosk deployments, the average ecoATM kiosk has the equivalent offsets of: diverting 25,681 tons of toxic mining waste by reclaiming/recycling precious metals, offsetting 4,309 Kg of greenhouse gases, saving 426 gallons of oil, removing 21 houses from the grid (electricity saved), removing 16 automobiles off the road, or planting 2000 trees. The ecoATM kiosks have a tremendous environmental impact and continue to grow in their collection of electronic devices. *The SBIR grant we received has helped tremendously in our pursuit of all 3 bottom lines and without that support we cannot pursue our business as quickly or effectively.*

Conclusions

In conclusion, it's a pleasure to share the ecoATM story and our financial, social, and environmental benefits. However, I should be clear that the SBIR process should not preclude investments in companies like ours that happen to be successful at raising

private venture capital. SBIR has already played an important role in our early success with a Phase 1 grant but because we have recently been successful at raising private venture capital we are in jeopardy of being disqualified for a Phase 2 grant because we no longer fit the mold. While hypothetically we may have still survived and existed without a Phase 1 grant or Phase 2 grant in the future, the grants are an accelerator and provide critical mass at a critical phase. Granting the same money elsewhere would not result in a greater public good.

I am sure the Committee shares my belief that it is critical for the US to retain its role as the world's leader in innovation. And in my view, allowing a mixture of SBIR and private investments is exactly the kind of public and private partnership that is needed to boost our mutual fortunes. I hope my testimony has been clear and will play a role in convincing the Committee, and the rest of the House of Representatives, that artificial limits on mixing SBIR with private investments should not be governed by the simple blunt instrument of a 25% cap but instead could be broadened even further, and in that expanded process should consider other criteria such as public benefit and probability of commercial success as important factors to future grants.

Thank you again for the opportunity to appear before this Committee. I look forward to answering your questions.

Chairman GRAVES. Thank you, Mr. Tullie. I now turn to Ranking Member Velázquez for the introduction of her witness.

Ms. VELÁZQUEZ. Thank you, Mr. Chairman. It is a great pleasure to welcome Dr. David B. Audretsch. He is the distinguished professor and Ameritech chair of economic development at Indiana University, as well as the director of IU's Institute for Development Strategies. Dr. Audretsch has written extensively on small business innovation and entrepreneurship. Additionally, he sits on the National Research Council's Committee for Capitalizing on Science, Technology, and Innovation and Assessment of the Small Business Innovation Research program. Welcome.

STATEMENT OF DAVID B. AUDRETSCH

Dr. AUDRETSCH. Thank you very much. Good afternoon, Chairman Graves and members of the Committee.

The impact of the SBIR program has been analyzed in considerable detail in a series of painstakingly meticulous studies undertaken by the board on science, technology, and economic policy of the National Research Council of the National Academy of Sciences as well as in a number of important studies by university scholars. After reviewing these studies I can summarize with confidence that the SBIR has generated a number of substantial benefits to the U.S. economy.

The country is no doubt more innovative, more competitive in the global economy and has generated more and better jobs as a result of the SBIR. What gives me so much conviction concerning these studies is the robustness of the findings. Studies with disparate methodologies ranking from case studies of recipient SBIR firms to interviews with program administrators at the funding agencies to systematic analyses of broadcasted surveys of firms and to sophisticated econometric studies based on objective measures comparing the performance of recipient SBIR firms with control groups consisting of matched pairs that did not receive any SBIR support.

They all point to exactly the same thing. The SBIR has made a key in unequivocal contribution to the innovative performance of the United States, especially in terms of technological innovation. In particular, a number of key benefits emanating from the SBIR program can be identified from these studies. The key economic benefits accruing from implementation of the SBIR are most compelling in terms of two of the objectives stated in the congressional mandate, the promotion of technological innovation and increased commercialization from investments in research and development.

There is strong and compelling evidence that the United States is considerably more innovative as a result of the SBIR program than it would be without the SBIR program. The empirical evidence suggests that first of all recipient firms, SBIR firms, are more innovative. Existing small business is more innovative as a result of the SBIR program. A careful study undertaken by the National Research Council at the National Academy of Sciences found that around two-thirds of the projects funded by SBIR grants would not have been undertaken in the absence of SBIR funding. That same study also identified a remarkably high rate of innovative activity emanating from the SBIR-funded projects. Slightly less than half of the SBIR-funded projects actually resulted in an inno-

vation in the form of a new product or service that was introduced in the market. Such a high rate of innovative success is striking given the inherently early stage and high risk nature of the funded projects.

Second, the SBIR has generated more technology-based startups. The SBIR program results in a greater number of technology-based firms. One key study found that over one-fifth of all recipient SBIR companies would not have existed in the absence of having received an SBIR award.

Third, recipient SBIR firms have stronger growth performance. Studies consistently find the firms receiving SBIR grants exhibit higher growth rates than do control groups consisting of matched pair companies.

Fourth, recipient SBIR firms are more likely to survive. The early phase for technology entrepreneurial ventures has been characterized as what we heard from the ranking member. It has been characterized as the valley of death. The empirical evidence suggests that the likelihood of surviving this valley of death for young technology-based SBIR firms is greater than for comparable companies in carefully selected control groups.

In terms of the second objective, congressional objective in the mandate for the SBIR enhancing the commercialization emanating from the country's expensive investments in research and development. Systematical empirical studies reveal that the SBIR has resulted in greater commercialization of university-based research. Empirical evidence points to a high involvement of universities in SBIR-funded projects. One or more founders have been employed at university and two-thirds of the SBIR recipient firms. More than one-quarter of the SBIR-funded projects involved contractors from university faculty.

The studies also indicate that the SBIR has increased the number of university entrepreneurs—entrepreneurs coming from universities. The studies find that scientists and engineers from universities have become entrepreneurs and started new companies who otherwise might never have been entrepreneurial. Some of these university-based entrepreneurs are involved in firms that have received SBIR grants. Others have been inspired to become entrepreneurs as a result of learning about the efficacy of becoming an entrepreneur from the observed success and experience by observing their colleagues who have been involved with SBIR-funded companies.

Despite the compelling empirical evidence of the strong and significant impact of the SBIR program that it has had on the innovative performance of the United States, I should stress several key qualifications and concerns. The first is the congressional goal of increasing the participation of minorities and disadvantaged people in the process of technological innovation remains undeveloped. Female participation has increased only marginally over time. SBIR phase two awards to women increased only from eight percent of the total awards in the early 1990s to 9.5 percent between 1999 and 2001. Minority participation has actually decreased over time. Minority-owned firms fell below 10 percent for the first time in 2004 and this trend has subsequently continued. Creative ways to enhance the inclusion of previously largely excluded groups in the

population and in particular women and minorities in the SBIR program will enhance the innovative performance of the United States.

A second concern is that SBIR awards remain geographically concentrated in just a handful of regions. Increasing the participation of SBIR awards outside of these innovative clusters will make a significant contribution to facilitating innovative activities not just in these regions but ultimately in the entire country.

In conclusion, let me point out that this decade has seen a receding performance of U.S. global leadership of innovation. Globalization means that the U.S. has lost its once near monopoly in terms of technological and innovative leadership. The SBIR has a central role to play in contributing to a renewed U.S. global technological leadership in ensuring that the United States is securely encased as a global innovative leader. Nearly three decades have transpired since the enactment of the SBIR by the Congress. This has provided a good basis for in-depth and careful independent scrutiny analyzing the impact of the SBIR program on the United States. The evidence accumulated from a broad spectrum of studies utilizing divergent methodologies all comes to the same result. The SBIR program has unequivocally made an invaluable contribution to the innovative performance of the United States. However, as global competition intensifies the SBIR program must continue to be adjusted and improved in order to generate the innovative performance and ultimately renewed global innovative leader that this country deserves and of which it is capable.

Thank you very much.

[The statement of Dr. Audretsch follows:]

**Testimony of David B. Audretsch
Indiana University**

**To the House of Representatives
Committee on Small Business
March 16, 2011**

Good morning Chairman Graves and members of the Committee. My name is David Audretsch, and I am a professor at Indiana University. My research specialty has been on small business, entrepreneurship, innovation and the role of public policy. I also serve on the Committee for Capitalizing on Science, Technology, and Innovation: An Assessment of the Small Business Innovation Research Program, which oversees the work done by the National Research Council of the National Academy of Sciences in assessing and evaluating the impact of the Small Business Innovation Research Program (SBIR).

Our current economic malaise is not the first time that the U.S. has faced serious economic challenges. Like now, the decade of the 1970s was characterized by sluggish growth, persistent high rates of unemployment, and inadequate rates of job creation. In response to these economic problems, the Congress enacted the Small Business Innovation Research Program (SBIR) in 1982 with an explicit goal of reinvigorating jobs and growth through enhancing the innovative capabilities of the United States. In particular, the explicit mandate created by the Congress was to (1) promote technological innovation; (2) enhance the commercialization of new ideas emanating from scientific research; (3) increase the role of small business in meeting the needs of federal research and development; and (4) expand the involvement of minority and disadvantage persons in innovative activity.

The SBIR program functions through the 11 federal agencies which administer the program and award around \$2.5 billion annually for innovative activity by small business. Qualifying small business is eligible to apply for grants from the participating federal agencies ranging from \$150,000 for a Phase I award, to \$1,000,000 for a typical Phase II award.

The Economic Benefits of the SBIR Program

The impact of the SBIR program has been analyzed in considerable detail in a series of meticulous studies undertaken by the Board on Science, Technology and Economic Policy of the National Research Council of the National Academy of Sciences, as well as in a number of important studies by university scholars. After reviewing these studies, I can summarize with confidence that the SBIR has generated a number of substantial benefits to the U.S. economy. The country is no doubt more innovative, more competitive in the global economy and has generated more and better jobs as a result of the SBIR. What gives me so much conviction concerning these studies is the robustness of the findings. Studies with disparate methodologies, ranging from case studies of recipient SBIR firms, to interviews with program administrators at the funding agencies, to systematic analyses of broad based surveys of firms, and to sophisticated econometric studies based on objective measures comparing the performance of recipient SBIR firms with control groups consisting of matched pairs that did not receive any SBIR support all point to the same thing – the SBIR has made a key and unequivocal contribution to the innovative performance of the United States, especially in terms of technological innovation.

In particular, a number of key benefits emanating from the SBIR program can be identified from the literature. The key economic benefits accruing from implementation of the SBIR are most compelling in terms of two of the objectives stated in the Congressional mandate – the promotion of technological innovation, and increased commercialization from investments in research and development

There is strong and compelling evidence that the United States is considerably more innovative as a result of the SBIR program than it would be without the SBIR program. Empirical evidence suggests that:

- **Recipient SBIR Firms Are More Innovative.** Existing small business is more innovative as a result of the SBIR program. A meticulous study undertaken by the National Research Council of the National Academy of Sciences found that around two-thirds of the projects funded by SBIR grants would not have been undertaken in the absence of SBIR funding.¹ The same study also identified a remarkably high rate of innovative activity emanating from the SBIR funded projects. Slightly less than half of the SBIR funded projects actually resulted in an innovation in the form of a new product or service that was introduced in the market. Such a high rate of innovative success is striking given the inherently early stage and high risk nature of the funded projects.
- **The SBIR Has Generated More Technology Based Startups.** The SBIR program results in a greater number of technology based firms. One key study found that over one-fifth of all recipient SBIR companies would not have existed in the absence of having received an SBIR award.
- **Recipient SBIR Firms Have Stronger Growth Performance.** Studies consistently find that firms receiving SBIR grants exhibit higher growth rates than do control groups control of matched-pair companies.
- **Recipient SBIR Firms Are More Likely to Survive.** The early phase for technology entrepreneurial ventures has been characterized as “the valley of death”. The empirical evidence suggests that the likelihood of survival for young technology-based SBIR recipients is greater than for comparable companies in carefully selected control groups.

In terms of enhancing the commercialization emanating from the country’s expensive investments in research and development, systematic empirical studies reveal that:

- **The SBIR Has Resulted in Greater Commercialization of University-Based Research.** Empirical evidence points to a high involvement of universities in SBIR funded projects. One or more founders have been employed at a university in two-thirds of the SBIR recipient firms. More than one-quarter of the SBIR funded projects involved contractors from university faculty.
- **The SBIR Has Increased the Number of University Entrepreneurs.** Studies find that scientists and engineers from universities have become entrepreneurs and started new

¹ National Research Council, *An Assessment of the SBIR Program*. C. Wessner (ed.), Washington, D.C.: National Academies Press, 2008.

companies who otherwise might never have been entrepreneurial. Some of these university-based entrepreneurs are involved in firms that have received SBIR grants. Others have been inspired to become entrepreneurs as a result of learning about the efficacy of becoming an entrepreneur from the observed success and experiences by observing their colleagues who have been involved with SBIR funded companies.

Qualifications and Concerns

Despite the compelling empirical evidence of the strong and significant impact the SBIR program has had on the innovative performance of the United States, I should stress several key qualifications and concerns

- **The Congressional Goal of Increasing the Participation of Minorities and Disadvantaged People in the Process of Technological Innovation Remains Undeveloped.** Female participation has increased only marginally over time. SBIR Phase II awards to women increased only from 8 percent of the total awards in the early 1990s to 9.5 percent between 1999 and 2001. Minority participation has actually decreased over time. Minority owned firms fell to below ten percent for the first time in 2004, and this trend has subsequently continued. Creative ways to enhance the inclusion of previously largely excluded groups in the population, and in particular women and minorities in the SBIR, program will enhance the innovative performance of the United States
- **SBIR Awards Remain Geographically Concentrated in Just a Handful of Regions.** Increasing the participation of SBIR awards outside of these innovative clusters will make a significant contribution to facilitating innovative activities, not just in these regions, but ultimately in the entire country.

Summary

This decade has seen a receding performance of U.S. global leadership of innovation. Globalization means that the U.S. has lost its once near monopoly in terms of technological and innovative leadership. The SBIR has a central role to play in contributing to a renewed U.S. global technological leadership and ensuring that the United States is securely encased as the global innovative leader.

Nearly three decades have transpired since the enactment of the SBIR by the Congress. This has provided an adequate basis for in depth and careful independent scrutiny analyzing the impact of the SBIR program on the United States. The evidence accumulated from a broad spectrum of studies utilizing divergent methodologies all comes to the same result – the SBIR program has unequivocally made an invaluable contribution to the innovative performance of the United States. However, as global competition intensifies, the SBIR program must continue to be adjusted and improved in order to generate the innovative performance and ultimately renewed global leader that this country deserves and of which it is capable.

Chairman GRAVES. Thank you. We will next have Dr. Michael Squillante. He is the Vice President of Research at Radiation Monitoring Devices or RMD, in Watertown, Massachusetts. He is also the chairman of the board of the Small Business Technology Council. He received his Ph.D. in chemistry from Tufts University in Medford, Massachusetts in 1980 and has been a full-time employee of RMD ever since. In his role he oversees the company's research and development activities across a broad spectrum of areas, including research programs and development instrumentation for cancer diagnosis, scientific research, and industrial testing. Thanks for being here today.

STATEMENT OF MICHAEL SQUILLANTE

Dr. SQUILLANTE. Thank you. I appreciate the opportunity, Chairman Graves, Ranking Member Velazquez, and Committee members. I am here today representing the Small Business Technology Council.

Since 1982, the Small Business Innovation Research program has been the principal means by which the federal government funds innovation research at small companies. This was not enacted to help the struggling small companies get by; it was enacted to require the federal government to make use of the innovation efficiency that is inherent in small firms.

In 1982, Congress found that innovation creates jobs and small business is the principal source of significant innovation.

The SBIR program was enacted with four goals in mind—stimulate technological innovation, use small business to meet federal research development needs, increase private sector commercialization of innovations, to foster and encourage participation of minority and disadvantaged persons in technological innovation. Prior to the SBIR program about three percent of federal R&D funds went to small firms. Now with the SBIR and STTR programs included that number is only about four percent, most of it obviously coming through SBIR.

But during that time the percentage of American scientists and engineers working at small companies rose from six percent to 38 percent.

The SBIR is attracting new companies. Thirty percent of awards are given to new companies each year and SBIR has been a success. In 2008, the National Research Council of the National Academy of Sciences reported on their study. In the summary of the key findings the NRC concluded the core finding of the study is that the SBIR program is sound in concept and effective in practice, and, currently the program is delivering results that meet most of the congressional objectives.

It is widely accepted that technological innovations and new jobs come from small business. In addition, data on patent applications show that small firms are by far the most efficient and productive inventors on the basis of patents awarded per dollar of federal funding received compared to large firms, national laboratories, or universities.

And the companies are commercializing their innovations. The NRC study and earlier GAO studies found that the SBIR and STTR programs have between a 30 and 50 percent commercializa-

tion success measured on the basis of return on investment of federal funding. This is an incredibly high number compared to other studies of commercial firms and consumer companies.

So it is time to move forward. We appreciate greatly that you are starting to focus on this program very early in the session. The SBIR legislation has been delayed for almost three years with 10 continuing resolutions while we wrangled over the issue of venture capital participation. That issue is now resolved to the satisfaction of all of the parties involved with a bipartisan compromise that is reflected in the Senate bill that was recently approved in the Senate Small Business Committee. The parties involved in this were SBTC, Biotechnology Industry Organization, National Venture Capital Association, U.S. Chamber of Commerce, National Defense Industrial Association, the New England Innovation Alliance and the Bay Area Innovation Alliance. This long delay is causing uncertainty and hardship, and we encourage the House to act quickly on this bill.

For recommendations we support the compromise that is the basis of the Senate bill and recommend that the House include similar provisions that are in that bill. Some of the significant ones are increasing the size of the SBIR set aside. Award sizes are increasing and in order to keep the number of awards from decreasing excessively a modest increase in the size of the SBIR program is needed.

So we support the gradual increase of the program from two and a half to three and a half percent. This is a conservative increase, and even with it the number of awards will be reduced. Without the increase, reduction of the awards would be a disaster for the program. In terms of the STTR program, we believe that should be increased more significantly.

To further mitigate the decrease in the number of awards we support the enactment of a cap on the maximum phase one and phase two award sizes. Without this the reduced number of awards would make the program untenable for many small companies, especially the newer, smaller firms that are trying to break into the program. We encourage you to act soon to end this period of uncertainty. We are very sympathetic to the fiscal challenges faced by Congress this year and we only ask that you understand the plight of the small companies and their employees as you proceed.

I appreciate the opportunity to speak to you today. And Mr. Chairman, I would appreciate if I could have the opportunity to revise and amend my testimony.

[The information follows:]



Testimony of

Michael R. Squillante, Ph.D.

*Vice President of Research
Radiation Monitoring Devices, Inc.
44 Hunt Street
Watertown, MA 02472
<http://www.rmdinc.com/index.html>*

Appearing Today As The

*Chairman, Board of Directors
Small Business Technology Council
1156 15th Street NW, Suite 1100
Washington, DC*

Before The

**COMMITTEE ON SMALL BUSINESS
UNITED STATES HOUSE OF REPRESENTATIVES**

**Wednesday, March 16, 2011 at 1:00 p.m.
Room 2360 of the Rayburn House Office Building.**

**Spurring Innovation and Job Creation:
The SBIR Program**

On behalf of

The Small Business Technology Council
(202) 785-4300
www.sbtc.org

of

The National Small Business Association
(202) 293-8830
www.nsba.biz

SBTC is the nation's largest association of small, technology-based companies in diverse fields, and represents more companies that are active in the federal Small Business Innovation Research (SBIR) Program than any other organization. SBTC is proud to serve as the technology council of the National Small Business Association.

Founded in 1937, the National Small Business Association (NSBA) is the nation's oldest nonprofit advocacy organization for small business, serving more than 150,000 small companies throughout the United States.

Chairman Graves, Ranking Member Velázquez, members of the Committee, thank you for the opportunity to appear here today to discuss the views of the small, high-tech companies on Spurring Innovation and Job Creation: The SBIR Program. I am Michael R. Squillante, Vice President of Research for Radiation Monitoring Devices, Inc. (RMD) of Watertown, MA. I am appearing here today as the Chairman of the Board of Directors of the Small Business Technology Council (SBTC) of the National Small Business Association (NSBA) in Washington, DC. SBTC is an outgrowth of the White House Conference on Small Business in 1995, and is the nation's largest association of small, high-tech SBIR and STTR companies in diverse fields. NSBA serves more than 150,000 small companies throughout the United States.

SBTC welcomes your Committee taking an early lead in this new Congressional term in considering the SBIR program reauthorization. We are pleased to work with you and your capable staff to answer any questions you may have today or in the future. In this spirit, we have provided considerable factual information in this testimony regarding the SBIR and STTR program and the contribution of small, high-tech companies on innovation and job creation.

Chairman Graves, we want to state at the outset that we are heartened to see your strong support for and understanding of the importance of small businesses in job creation and innovation as stated in your official House biography as quoted below:

"Small businesses create 7 out of every 10 jobs in this country. It is important that our policies encourage innovators and entrepreneurs to follow their dreams and create jobs."
– Congressman Sam Graves, Chairman, House Committee on Small Business.¹

With the support on this issue from the White House, as quoted by President Obama on February 18, 2011 at a high-tech meeting, we are hopeful for early reauthorization:

"Basically, if we want to win the future, America has to out-build, and out-innovate, and out-educate and out-hustle the rest of the world." – President Barack Obama.²

We could not have said either statement better. I am pleased to provide the Committee with an overview and brief history of the SBIR and STTR programs and the issues surrounding the reauthorization. I have been involved with the SBIR program since its inception in 1982, and successfully led projects through the research and development stage to successful commercialization. I was Principal Investigator and Program Manager on numerous programs funded by various government agencies, including NASA, NIH, NSF, DOE, EPA and DOD, for the development of materials, sensors and instruments for cancer diagnosis, scientific research and industrial testing. I joined RMD in 1980 after receiving my Ph.D. in Chemistry from Tufts University in Medford, MA. I am also an Adjunct Professor of Physics at the University of Massachusetts in Lowell. This provides me with a deep personal understanding of the value of the industry/university collaborations possible with the SBIR and STTR program. (See Appendix A for the New England Innovation Alliance survey of SBIR/STTR and university participation.)

I. The SBIR Program History: The original SBIR legislation was started almost exactly 30 years ago by Representative Jerry Lewis (R-CA) when he sponsored H.R. 3091 on April 7, 1981 with 56 cosponsors (28 Republican, 28 Democrat). It was subsequently reintroduced as H.R. 4326 on July 29, 1981 with 189 bipartisan cosponsors. On June 27, 1982 H.R. 4326 was laid on the table in the House, and S.881 (amended) was passed in lieu. S.881 was sponsored by Senator Warren Rudman (R-NH) and cosponsored by Barry Goldwater (R-AZ) also on April 7, 1981, with 83 other bipartisan cosponsors. It was strongly supported by the Administration of, and signed into law as PL 97-219 by, the Republican iconic champion of Free Markets, President Ronald Reagan on July 22, 1982, in the midst of the recession lasting from July 1981 to November 1982.³

II. Congressional Findings and Purpose of the SBIR Program: The House and Senate records clearly show that the SBIR program **was not an allocation to help needy small companies.** Rather it was a strong signal to Federal Agencies to make more effective use of the innovative scientists and engineers employed by aggressive small companies that had the potential to convert R&D funds into new products and create new jobs – to optimize return on taxpayers' dollars.

From the PL-97-219 House and Senate Findings and Purpose it was clear that the SBIR program was intended to maximize the return on taxpayers' innovation dollars by forcing the Federal Agencies overseeing this R&D funding to utilize more small businesses because: (see Appendix B)

“(3) small businesses are among the most cost-effective performers of research and development and are particularly capable of developing research and development results into new products.”

III. Reauthorization and Increase of SBIR and STTR in 1992: The 1992 SBIR reauthorization legislation was introduced in the House as H.R. 4400 on March 5, 1992 (with 47 bi-partisan co-sponsors) which doubled the SBIR allocation rate to 2.5 percent and increased the STTR allocation rate to 0.3 percent. Senator Rudman also sponsored the Senate 1992 SBIR reauthorization legislation (with 21 bi-partisan co-sponsors) The Hearings were held shortly after the recession which dated from July 1990 to March 1991. PL-102-564 was signed into law by President George H. W. Bush on October 28, 1992.

The House Findings for H.R. 4400 below show further House support for the SBIR program and frustration that the Federal Agencies had not increased small business R&D contracting [Appendix C]:

“(3) small businesses participating in the Small Business Innovation Research Program have demonstrated that they are among the most competent and cost-effective providers of high quality research and development; [Emphasis added.]

(4) small businesses participating in the Small Business Innovation Research Program have provided innovative products and services which are vital to the national defense, the exploration of space, the advancement of science, the promotion of the health, safety, and welfare of United States citizens, and many other fields important to the functions of the Federal Government;

(5) the Small Business Innovation Research Program has been successful in converting Federal research and development into innovative products benefiting both the United States Government and the commercial marketplace;

(6) by moving technology from the laboratory to the marketplace, the Small Business Innovation Research Program has expanded business opportunities, increased productivity, created jobs, stimulated the introduction of new products by high technology-related firms, and made United States industry more competitive; [Emphasis added.]

(7) the Small Business Innovation Research Program has also resulted in a positive benefit to the Nation's balance of trade by increasing exports from small businesses;

(8) Federal employees have exhibited skill and innovation in implementing the Small Business Innovation Research Program;

(9) the Small Business Innovation Research Program can provide productive employment to the Nation's scientists and engineers who have been displaced due to cuts in the budget of the Department of Defense and due to economic recession; and

(10) despite the fact the Small Business Innovation Research Program has achieved its participation goals, the proportion of Federal funds for industrial research and development received by small businesses remains at 3 percent (the same level as 10 years ago), although private sector use of small businesses for research and development doubled in the 1980's." [Emphasis added.]

The original impetus for the SBIR program came from joint House and Senate Small Business Committee hearings on August 9 and 10, 1978, where it was found that there was a severe under-utilization of small businesses in Federally funded research and development (R&D).⁴ The conclusions of these hearings were that Federal R&D funds could be more efficiently utilized by small businesses.

IV. How The SBIR and STTR Programs Work: First, it is important to state that the SBIR and STTR programs are not separate appropriations for small businesses. Rather, they are an allocation of already appropriated Federal R&D funds (currently 2.5% for SBIR and 0.6% for STTR) for each Federal Agency with more than \$100 million in R&D funds (SBIR) and more than \$1 billion (STTR). This allocation ensures that the major R&D agencies make use of small businesses to maximize the return on taxpayers' dollars.

The primary difference between the SBIR and STTR programs is that for the STTR program at least 30%, but no more than 60%, of the project must be conducted by a university or non-profit.

The SBIR and STTR programs are effective Federally funded R&D programs because they are multi-phase programs as follows (Table 1 below from the DoD web site):⁵

The genius of the SBIR/STTR programs is that there is a "down-select" going from Phase I to Phase II. The SBIR/STTR contractors must provide the funding agency with a progress report on the completion of the Phase I project and a proposal for the Phase II funds. Only about 40% of the Phase I projects move to Phase II – thus only the best of the projects advance to the Phase II development stage.

In Phase III, Congress included special contractual protections for the small businesses that developed the technology which has helped improve the commercialization rate.

The other Federal Agencies involved in the SBIR and STTR programs have some variations on the DoD chart shown. Congress legislated that the U.S. Small Business Administration is to issue a "Policy Directive" providing consistent regulations and guidelines for the programs across all agencies.

The competition for the program is quite strong and while it varies across agencies and time it is typically 10-12 Phase I proposals for each award, and approximately 40-50% of the Phase I

Three Phased Program

	SBIR	STTR
✓ Phase I: Project feasibility	5 months up to \$150,000	12 months up to \$100,000
✓ Phase II: Project development to Prototype	2 years up to \$1,000,000	2 years up to \$750,000
✓ Phase III: Commercialization	Commercialize, with non-SBIR/non-STTR funds, the technology in military and/or private sector markets	

Table 1. Overview of SBIR & STTR Programs

awards go to Phase II. This means the competition for the larger Phase II awards is about 20 Phase I proposals for each successful progression to a Phase II, \$750,000 - \$1 million award. The programs are working well as discussed below and in Appendix D.

V. Impact of SBIR/STTR on Selected States:

We recognize the critically important role that venture capital plays in our society. However, by its very nature, VC funding inherently tends to concentrate in a small number of specific geographic regions. The SBIR and STTR programs have been particularly beneficial to the states that are traditionally ignored by the venture capital industry. The VC community concentrates approximately 70% of its investments in California, New England and Metro New York,⁶ with only token amounts in the Midwest, south, and rural states. SBIR and STTR on the other hand encourage proposals from all states. Since the proposals are simplified to a 25-page limit, good submittals are obtained from every state.

The information on SBIR-STTR data versus VC funding for the states represented by the members of the House Committee on Small Business is shown below in Figure 2, from information provided by Innovation Development Institute (IDI), Ann Eskesen, President, Swampscott, MA.⁷

State	Life of Program: 1983-present (to include FY 11 amounts reported for FY 10-March 2011)				Current SBIR Activity: Research data for period 2007-present			
	Total # Awardees	Total SBIR-STTR Awards		VC-funded Firms	Total # Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars*
		Phase I	Phase II			Phase I	Phase II	
CA	3,348	189,073	7,448	571	884	2,674	1,387	\$1,136,757,535
CO	650	3,684	1,587	38	189	703	342	\$275,579,868
FL	621	2,677	815	33	153	381	175	\$145,575,578
IA	137	316	79	5	28	41	22	\$13,571,576
IL	483	1,489	550	38	120	305	154	\$118,421,836
LA	68	225	78	4	15	38	15	\$13,822,540
MA	1,582	12,641	4,883	275	425	1,811	885	\$747,465,728
MD	351	4,453	1,652	109	240	738	285	\$282,310,815
MI	485	1,737	701	38	137	349	170	\$142,313,335
MO	177	500	156	22	57	112	37	\$27,284,512
NC	438	1,325	580	68	127	239	122	\$111,134,670
NY	975	3,814	1,571	82	275	798	375	\$315,248,208
OH	678	3,344	1,287	27	195	885	288	\$240,205,631
OR	257	1,070	473	21	75	183	88	\$78,042,115
PA	834	3,382	1,354	34	217	817	270	\$229,672,366
RI	86	275	121	12	28	51	31	\$32,579,256
SC	65	226	84	5	28	68	38	\$18,104,588
TN	217	747	300	4	44	137	53	\$42,538,391
WA	541	2,032	885	71	148	244	181	\$143,258,975
Totals for the 16 states	13,983	122,679	34,534	522,477	3,467	10,547	4,957	\$4,056,839,347
Non-reporting states	13,504	50,345	35,138	634,853	5,127	15,384	7,258	\$7,825,967,375

* There is a considerable time-lag between Phase I and award of Phase II. It is not unusual to see Phase II design 2.5-4 years after the Phase I award. Similarly, especially in NIH, Phase II award assignments are awarded and reported incrementally (usually annually). Consequently, one can properly assume that totals and Phase I dollars on current projects will continue to increase, sometimes substantially.

Source: Innovation Development Institute, Swampscott, MA. Copyright 2007-2011. All Rights Reserved

Table 2. SBIR and VC Impacts by Committee Members' States

Additional information from IDI on the SBIR-STTR awards by Committee members' states and districts is included in Appendix E. Further information from IDI on the contribution of SBIR-STTR to the technology employment in Committee members' states is included in Appendix F.

Clearly the SBIR and STTR programs are having a major positive impact on states that are not well served by the venture capital firms, and generally on all states. Additional information can be provided if required. The SBA Office of Technology maintains a public Internet database of all SBIR and STTR awards at http://web.sba.gov/tech-net/public/dsp_search.cfm and information on state awards by a number of search parameters may be obtained online.

VI. High Quality of SBIR/STTR Research: The SBIR program is addressing exactly the very same demanding advanced scientific and technology challenges as those addressed by universities and large businesses doing research for the Federal Government. All proposals receive stringent “peer reviews” and selection is made on the best scientific and technical approach to the agencies’ needs as determined by the reviewers. Please note that review panels for SBIR/STTR proposals typically include university professors, scientists from our major research hospitals, and scientists and engineers from the national laboratories.

The high quality of the SBIR and STTR programs has been evaluated many times by GAO, and by the National Research Council as a result of their 6-year study of the SBIR/STTR program which was mandated by the House in the 2000 reauthorization. This NRC study⁸ is an excellent and extremely thorough analysis of the two programs and we recommended it highly to obtain an in-depth review of these programs. [This subject is covered in more detail in **Section IX.5** below and in Appendices D (SBIR – It Is Working!, by SBTC), G (GAO Report excerpts) and H (NRC Report excerpts).]

Of particular interest is the high commercialization rate for the SBIR program. The GAO and NRC studies both found that SBIR and STTR projects have between a 30% and 50% commercialization success – amazingly high compared to university funded projects as discussed later. It is even remarkably high compared to many studies of commercial or consumer companies that report a 10% to 15% commercialization rate.⁹ During the previous reauthorizations for the programs, Congress required a that “commercialization plan” be included in Phase II proposals and this appears to have increased the commercialization rates.

VII. Issues on Reauthorization: SBTC would like to state at the beginning of this discussion that we support the proposed current legislation by the Senate, S.493. Late last year, the Small Business Technology Council (SBTC), the Biotechnology Industry Organization (BIO), SBANE, Bay area Innovation Alliance, US Chamber of Commerce, NDIA, NABA, Calif. SB, NEIA and NVCA finally reached a compromise, which paved the way for last year’s proposed legislation, S.4053, reintroduced this year as S.493. Among other things, the compromise allowed U.S. majority-VC-owned businesses into the program, but limited their participation to ensure that small businesses not backed by large firms are not edged out of the program. SBTC members and Board of Directors supported the compromise legislation last Congress, and we continue to support the compromise legislation as long as it holds together.

The current process to reauthorize the SBIR program has been going on for almost 5 years. Since the last reauthorization expired in 2008, there have been 10 continuing resolutions keeping this program going a few months at a time. The Federal Agencies and the small businesses that depend on this program need to know with certainty that this program is going to be around for the long term to plan their budgeting and staffing. By only extending the program a few months at a time, Federal Agencies and small businesses are forced to guess whether or not they will have funding for future projects. This is inefficient.

1. **First, The VC Question:** For most of this period, the issue holding up reauthorization has been whether or not to allow majority venture capital (VC) owned firms into the program. The compromise discussed above answers that question to the satisfaction of

SBTC. This compromise included a prohibition against majority-VC ownership by non-U.S. VC firms. The Federal Extra-mural R&D funds are U.S. taxpayer dollars and the benefits should accrue to U.S. firms and investors.

2. Second, Eliminating Phase I: During discussions over the past two years, the House version of the reauthorization included a provision to permit the agencies to eliminate Phase I and go directly to Phase II. We have opposed this plan because it strips out the heart of the success of the SBIR/STTR programs – the “down-select” at the end of the first 6-months of the projects.

Almost all paper proposals addressing very tough scientific challenges have interesting ideas from qualified principal investigators. However, when trying to solve very difficult scientific break-throughs, not all research projects succeed. That is the nature of advanced research.

As stated earlier, the genius of the SBIR/STTR programs is to **force** a down-select at the completion of the “feasibility phase” before proceeding to the “prototype phase.” By selecting only the best 40% to 50% of the Phase I projects, the maximum Federal R&D dollars are focused on the projects with the highest likelihood of success.

Instead of proposing to eliminate Phase I on the SBIR/STTR programs, we respectfully recommend that Congress apply this same “down-select” concept to the university programs. As shown later, the SBIR/STTR programs are orders of magnitude more effective in patents, innovations and commercial success compared to Federally funded university research.

3. Increase of the SBIR/STTR Award Amount: While every researcher would always like to have more funding to apply to their project, the dramatic increase in award size contemplated in the previous House proposals (H.R. 2965) would dramatically reduce the number of projects, without a commensurate increase in research value. The strict limitation on Phase I and Phase II award sizes over the 28-plus years of the programs have resulted in the production of extremely high numbers of quality research projects. Again, while individual companies and researchers would like to see these numbers increase, SBTC Board and members believe that this would be detrimental to taxpayers’ returns and the long-term interests of the successes of the SBIR/STTR programs.

Table 3. Impact of Dramatic Increases in SBIR Award Amounts (Assumes a \$2 Billion/year program and 50% down-select to Phase II)		
	Maximum Award Phase I & Phase II	Number of Awards per Year
Current SBIR Law	\$100,000 & \$750,000	4,210 Phase I & 2,105 Phase II
Proposed Increased Award Size (HR 2965)	\$250,000 & \$2,000,000	1,600 Phase I & 800 Phase II
Proposed Increased Award Size (S.493)	\$150,000 & \$1,000,000	3,076 Phase I & 1,538 Phase II

The agencies have the other 96% of their R&D budget that they can apply to increases to SBIR/STTR projects that they find particularly attractive. SBTC believes that the levels proposed in the Senate bill (S. 4053 last year and S.493 this year) are appropriate and we support such an increase. The NRC study concluded that these amounts were proper.¹⁰

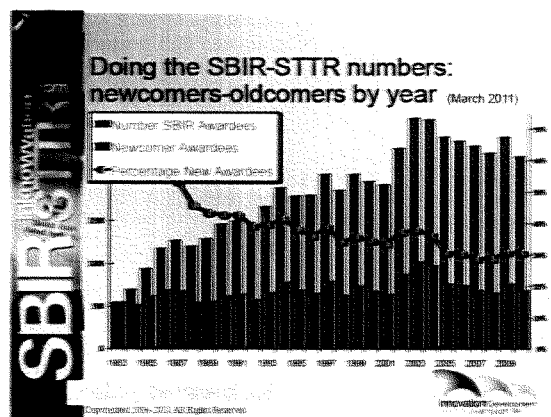
Our members also oppose permitting agencies to dramatically increase the upper limits of Phase I and Phase II awards. Again, the agencies have the other 96% of their budget to add to SBIR and STTR programs. Such increases from the SBIR and STTR budgets would dramatically reduce the number of awards as follows:

- a. One \$5.2 million award eliminates 8 Phase I and 4 Phase II awards.
- b. One \$10.2 million award eliminates 16 Phase I and 8 Phase II awards.

4. Increases in Award Size Without a Commensurate Increase In Allocation: The SBTC members and Board asked me to bring to your attention that the increases in award size contemplated in S.4053/S.493 would reduce the number of awards as shown in Table 2 unless the allocation is also increased. While we support S.4053/S.493 as is, we respectfully ask for consideration of this issue. A 36% increase in allocation would bring this back to parity in number of awards in both Phases I and II.

5. Retaining SBA Control of Policy Directives: SBTC recommends retaining SBA Office of Technology as the Federal Agency that interprets the legislation and issues the SBIR/STTR Policy Directives. This agency has performed this task well over the 28 years of the program. We would respectfully encourage the Committee to direct the SBA Administrator to staff this department adequately to perform the tasks outlined by this Committee for the administration of the programs. We further respectfully urge the Committee to require strict interpretation of the Congressional language and SBA Policy Directives in the implementation of the program in the various agencies. We would finally respectfully urge the Committee to require that SBA review and approve the SBIR regulations and guidelines of all implementing agencies and make certain that the SBIR processes and regulations are as simple and consistent as possible and that compliance does not place an undue burden on small business. We are concerned that allowing individual agencies to modify their programs with no oversight will make the application process confusing, difficult and overly burdensome for small businesses. One of the great successes of the SBIR program is that about 30% of all winners are new to the program each year, see IDI slide, Figure 1, below.¹¹ A key consideration for new regulations and guidelines should be on making it easier for new firms to participate, not harder. The SBA is the appropriate agency to guide this process.

Figure 1. SBIR Newcomers by Year



VIII. Next, Let's Counter the University Arguments Against Increasing the SBIR/STTR Allocations:

SBTC believes strongly that SBIR companies and the universities should not be fighting over their pieces of the Federal Extra-mural R&D pie (SBIR receives 2.5% of Federal R&D funding, and universities have averaged about 28%).¹² In the introduction to Congressional testimony in 1999, Jere W. Glover, now the Executive Director of SBTC, stated, "A proposal to create bridges, rather than walls, between these organizations is advanced to help ensure that the importance of the federal R&D funding of the entire continuum of the U.S. innovation process is communicated well to Congress and the public."¹³

As the NRC found in their study and as the New England Innovation Alliance survey found, there is already significant utilization of universities and university staffs by SBIR companies. (Appendix A)

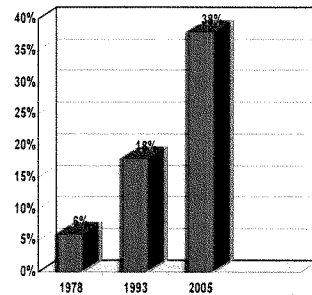
We know that the university lobbies and some universities will argue against increasing the allocation on the basis that this increase will come out of "their pot" of Federal R&D funding. We know this because:

1. During the initial SBIR Congressional deliberations and hearings for the legislation in 1982, the universities and their lobbyists testified against the program.¹⁴
2. During every SBIR and STTR Congressional hearing where universities and their lobbyists have had an opportunity to testify regarding increases in the program allocations, they have always opposed such increases.

So, let's look at the facts surrounding SBIR/STTR and University utilization of the Federal R&D funds:

1. **Both SBIR and STTR programs, and the universities are in competition for the same "Extra-mural" R&D funds from the Federal Government.** The SBIR/STTR legislation has very carefully defined what "Extra-mural R&D funds" mean and they essentially are the funds that Federal Agencies spend outside their own labs for Research and Development projects. The SBIR and STTR programs and universities must perform high quality research projects that meet Federal Agencies' needs.
2. **Universities' primary outputs are publication of the research and graduates seeking jobs; Small businesses' primary output is products – and jobs.** The historical "publish or perish" mandate for academics means that the primary output of their research is to publish their findings in peer-reviewed journals and on the Internet – which can be utilized by any other researcher, anywhere in the world. For small businesses, the primary goal is production of products and services – and they employ staff mostly in the United States – they are too small for globalization. Note that STTR and SBIR programs are very important ways university professors and their students can start companies to commercialize the research carried out in their labs.
3. **A significant transformation in our innovation sector has occurred over the almost 30 years of the SBIR/STTR programs.** Strikingly, there are now more scientists and engineers working in smaller companies (38%) than in any other sector. Some 27% of U.S. scientists and engineers currently work for large companies, 16% for universities, 13% for government, and 6% for nonprofits, see Figure 2 below.¹⁵

Figure 2. Percent of U.S. Scientists and Engineers Employed by Companies with Fewer than 500 Employees¹⁶



As found in the 1978 House and Senate Hearings referenced above, and in the Findings of the 102nd Congress hearings leading up to PL-102-564 of 1992:

“despite the general success of the small business innovation research program . . . funds received by small business concerns . . . has remained at 3 percent.”

In short, although the proportion of quality scientists and engineers has grown more than six-fold during the life of the SBIR program, the small company portion of the Federal R&D funds has remained almost the same over these past 30-plus years. And, as shown in Table 3, small businesses are the most productive of our technology sectors in converting dollars to patents. The commercial technology market has recognized the efficiency and cost saving of using small business. Outside of the highly qualified SBIR and STTR staffs, the Government Agencies have not.

IX. Why can't small business obtain a larger share of the Federal R&D funds without an "allocation" program? This is a great question that was answered in the 1978 Senate-House joint hearings referenced above and the House hearings of 1982 and 1992.

1. **What Congress found were the following market structural problems that prohibited a "free-market" competition for Federal R&D funds:**
 - a. Small businesses were always at a disadvantage when competing with large companies or universities for research projects – because Federal Program Managers and Contracting Officers would always take the safe bet for their careers – the large companies or universities. Who could criticize a career civil servant for choosing MIT or IBM over “Jane and Joe Smith's 5-person R&D shop?”
 - b. Universities had an “inside track” for almost all Federal R&D contracts because many of the decision makers and peer-review panels were staffed with university employees on loan to the agencies conducting the research. These individuals have a bias toward their fellow academics.

- c. Universities and large businesses have dedicated marketing organizations that are often larger than the entire technical staffs of the competing small companies and therefore are able to obtain “inside tracks” on procurements.

For these reasons, Congress in 1982 and 1992, with a strong history of full and open hearings going back to 1978, and with great bipartisan support passed and enlarged the SBIR program to correct this distortion in the Federal R&D funding market.

2. What agency management says about the SBIR/STTR program: The NRC study found that many agency management personnel supported the SBIR program, particularly in DoD where they were found to permit much faster deployment of the latest technology to the fighting forces (see Box 1, page 50 of the NRC report).¹⁷ From page 5 of the NRC study:

“Meeting Agency Procurement Needs. The SBIR program helps to meet the procurement needs of diverse federal agencies. At the Department of Defense, the Navy has achieved significant success in improving the insertion of SBIR-funded technologies into the acquisition process. The commitment of upper management to the effective operation of the program appears to be a key element of this success. Teaming among the SBIR program managers, agency procurement managers, the SBIR awardees, and, increasingly, the prime contractors is important in the transition of technologies from projects to products to integration in systems. At DoD, the growing importance of the SBIR program within the defense acquisition system is reflected in the growing interest of prime contractors, who are seeking opportunities to be in support of SBIR projects—a key step toward acquisition.”

DoD has capitalized on the SBIR/STTR programs to move advanced technology to the war front quickly by linking warfighters and Program Offices to the development of solicitation topics, and utilization of the Phase III process for quick-reaction contracting. In December 8, 2008, then Deputy Under Secretary of Defense, Acquisition and Technology, the Honorable James I. Finley wrote to the Secretaries of the Military Departments, and to the Directors of Defense Agencies (See Appendix I).

“...As a vehicle to tap thousands of high-technology small businesses for solutions, the SBIR Program is an exceptional source of innovation and industrial base vitality. As such, it is imperative that SBIR Phase III efforts be executed in a manner consistent with the tenets listed above. DoD SBIR policy discussed in this memorandum will be reflected, as appropriate, in DoD regulations. I appreciate your support and assistance.”

The Department of Energy has been especially forward thinking in the utilization of the SBIR/STTR programs as shown in September 15, 2010, Dr. Kristina M. Johnson, then the Under Secretary of Energy, wrote:¹⁸

“Today is a first for the Department of Energy, as \$57 million, including nearly \$11 million under the American Recovery and Reinvestment Act, is being awarded as part of our new Phase III *Xlerator* awards. This grant program builds off the Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer Program (STTR), and gives qualified small businesses around the country the staying power they need to bring their clean energy technology projects to commercialization.

With these Phase III *Xlerator* awards, 33 small businesses in 16 states will lead projects that received SBIR or STTR funding, teaming up with universities, national labs and industry to bring their work to the commercial marketplace. By drawing upon the

resources of universities, labs and industry, innovative small businesses will be able to develop the manufacturing processes needed to scale up production of their new and proven technologies.

The 33 small businesses receiving SBIR Phase III *Xlerator* awards are tackling big issues. These small businesses have demonstrated energy-efficient methods for harvesting algae to make a product that's competitive with petroleum. They are introducing lighting products that can go toe-to-toe with linear fluorescent technology. They are improving fuel cell technologies, reducing size, changing fuel membranes, and even adding wood saw dust to bio oil for a new integrated power system."

The statement to me by a retired senior Federal manager provides another perspective of the value of the programs to agency goals in areas not normally publicized:

"The SBIR program was, and is, a rich source of successful innovation for the Domestic Nuclear Detection Office. Small businesses have proven to be resourceful and creative, so it is particularly important for the federal government to provide a competitive mechanism for small companies to apply their expertise to important national needs."

Dr. William Hagen, Former Deputy Director, DHS Domestic Nuclear Detection Office (DNDO)¹⁹

3. SBIR/STTR Success Stories: The SBIR and STTR programs have experienced considerable success in meeting agency needs as reported by NRC. The agencies first provided reports of these successes and later developed web sites listing their successes. In some cases they improve agency research, in others they resulted in new products that could be commercialized, and for DoD, there were new products that provided advanced technology to the warfighters on a quick-reaction basis. Almost all of the SBIR/STTR agencies post their SBIR/STTR success stories on their web sites as follows:

- a. DOD: <http://www.dodsbir.com/SuccessStories/default.asp>
- b. NIH: http://grants.nih.gov/grants/funding/sbir_successes/sbir_successes.htm
- c. NASA: <http://sbir.nasa.gov/SBIR/success.htm>
- d. DOE: <http://www.science.doe.gov/sbir/Success.html>
- e. NIST/DOC: http://tsapps.nist.gov/success/sbir_successes/sbir_successes.cfm
- f. EPA: <http://www.epa.gov/ncer/sbir/success/>
- g. USDA: http://www.csrees.usda.gov/newsroom/impact/sbir_impacts.html
- h. Overall, if one Googles "SBIR Success Stories" there are approximately 35,000 responses (of course, some are redundant).

SBA began the "Tibbetts Awards" to recognize excellence in the program in companies, products and government program staff. The 2011 Tibbetts Awards, and a new award, the SBIR Hall of Fame Awards are listed on the SBA website at:

<http://www.sba.gov/content/sba-announces-winners-2011-tibbetts-awards>

4. What about the productivity of the SBIR/STTR program versus universities in the effective use of taxpayer Federal R&D funds?

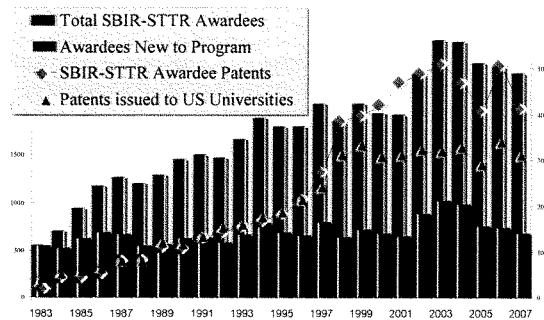
SBTC believes it is helpful to compare the productivity of the SBIR companies versus universities in two key critical factors shown below in Table 4.

Table 4. SBIR vs Universities in Dollars per Patent, and Commercialization Returns	
Dollars of Federal Funding per Patents Issued:	
Universities (Average 2007 to 2009) ²⁰	\$14, 940,401
SBIR Companies (Average 1982 to 2010) ²¹	\$ 421,975
Commercialization Returns:	
Universities 2009 Licensing = \$2.3 B (vs \$53.0 B funding) ²²	4.3 %
SBIR Companies (Average cash return per award) ²³	~ 50 %

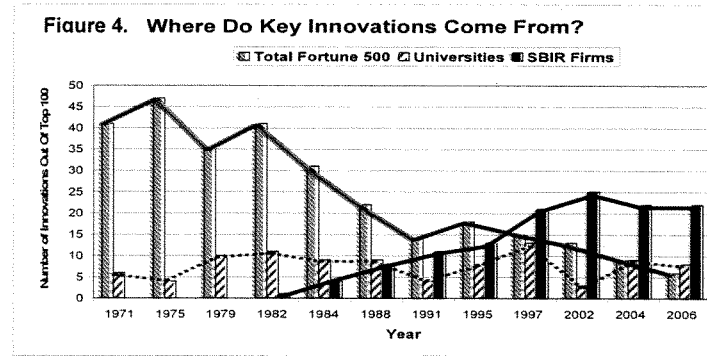
On these two measures, the SBIR program is 35 times more effective in generating patents per dollar of Federal R&D funding, and at least 10 times more effective in creating cash returns on the Federal R&D investment. However, this is not surprising. The primary purposes of the small businesses are to bring new products to market and to create jobs – and they do this quite well, creating more than two-thirds of the net new jobs in the past 15 years.²⁴ The primary purpose of universities is to provide highly qualified graduates to enter the U.S. economy²⁵ – and they do this quite well as all SBIR companies will attest (See Appendix J).

A further analysis of patents and where innovations come from is shown in Figure 3 from Innovation Development Institute.

Figure 3. Effectiveness of SBIR Companies vs Universities in Patents Issued²⁶



From a different perspective, the Information Technology and Innovation Foundation recently analyzed the annual lists of the 100 most technologically-important innovations, as selected each year by a panel of judges for *R&D Magazine*.²⁷ In Figure 4 below, the authors compared the performance of innovations from SBIR companies on these annual assessments, with those from Fortune 500 companies and universities.²⁸ [Note: The “missing” approximately 50-55% innovations of the chart are from other businesses large and small, collaborations between organizations, federal labs and spin-offs, and foreign innovations.]



As the chart indicates, for the past decade, about one-fourth of the most important technological innovations in the nation have been coming from the SBIR Program – with only 2.5 percent of the Federal Extramural R&D funding, vs approximately 28+ percent for the universities. Or, as the authors themselves put it:

“The results show that these SBIR-nurtured firms consistently account for a quarter of all R&D 100 award winners – a powerful indication that the SBIR Program has become a key force in the innovation economy of the United States.”²⁹

A rough calculation of dollars per innovation can be made by comparing the number of “Key Innovations” per Figure 3, the ITIF chart, with total funding provided over an average of two years to universities and the SBIR funding to SBIR companies (2005 to 2006). We have rounded up the university Key Innovations to 10 for the years 2004 to 2006, and have rounded down the SBIR Key Innovations to 20 for the same years. Based on the AUTM report for 2005 to 2006 the average university funding was \$43.5 billion,³⁰ and according to the NSF SBIR web site, the 2006 SBIR funding was approximately \$1.73 billion.³¹ The approximate results are shown in Table 5 below and show a ~ 50:1 multiplier of SBIR firms vs universities:

Table 5. Key Innovations Per Dollar of R&D Funding – Approximate Average 2005 to 2006			
Organization	Avg. Funding – Billions	Key Innovations-Average	\$/Key Innovation
Universities	~ \$43.5	~ 10	~ \$4.35 Billion
SBIR Companies	~ \$1.73	~ 20	~ \$86.5 Million

5. What about the quality of SBIR/STTR projects versus university-conducted research? This has been studied by both GAO and the National Research Council and they both found that the quality of the SBIR/STTR research is comparable to university research.

- a. **GAO Observations:** From: *Observations on the Small Business Innovation Research Program*, Statement for the Record of Anu K. Mittal, Director Natural Resources and Environment Team, GAO-05-861T, June 2005. See Appendix G.
- i. "Between July 1985 and June 1999, GAO. . . found that SBIR is achieving its goals . . . to stimulate commercialization of research results . . . Participating agencies and companies . . . generally rated the program highly."
 - ii. "*High-quality research. . . more than three-quarters of the research conducted with SBIR funding was as good as or better than other agency-funded research.* Agency officials also rated the research as more likely than other research they oversaw to result in the invention and commercialization of new products. . ." [Emphasis added.]
 - iii. "*Widespread competition. . . had a high level of competition, and consistently has had a high number of first-time participants. . . We also found that the agencies deemed many more proposals worthy of awards than they were able to fund. For example, the Air Force deemed 1,174 proposals worthy of awards in fiscal year 1993 but funded only 470.*"
 - iv. "*Successful commercialization.* SBIR successfully fosters commercialization of research results.
 - v. "*Helping to serve mission needs.* SBIR has helped serve agencies' missions and R&D needs.
- b. **National Research Council Study.** This 2008 study was mandated by the House and involved a 6-year assessment of the entire SBIR program at all agencies.³² The report has been presented to Congress and some of the findings are presented here. See Appendix H for details.

NATIONAL RESEARCH COUNCIL (NRC) STUDY FINDINGS:

- i. "The Small Business Innovation Research (SBIR) Program Is Making Significant Progress in Achieving the Congressional Goals for the Program.
- ii. Overall, the Program Has Made Significant Progress in Achieving its Congressional Objectives by: Stimulating Technical Innovation
- iii. Using Small Businesses to Meet Federal Research and Development Needs.
- iv. Increasing Private Sector Commercialization of Innovation Derived from Federal Research and Development.
- vi. SBIR Is Meeting Federal R&D. The NRC survey revealed that 56 percent of surveyed projects were successful in attracting additional funding from a variety of sources.
- vii. Linking Universities to the Public and Private Markets. . . a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself . . ."

X. Proposed Dramatic Increase in the STTR Allocation: We appreciate the great contribution that universities make to advancing knowledge. As stated in Jere Glover's 1999 testimony,³³ SBTC believes in a cooperative relationship between universities and small businesses such as envisioned by Congress in establishing the STTR program. In this economic time with the need to allocate the federal funds to the most efficient use, we think it is better for the knowledge sector and the jobs/money sector to work together. For this reason, we have proposed a dramatic increase in the STTR program. This program provides an excellent opportunity for universities and small businesses to work together to the mutual benefit of all – especially the taxpayers. A detailed discussion by SBTC of expanding the STTR program is included in this testimony as Appendix K.

As mentioned earlier, I have found that the SBIR and STTR programs foster collaborations between small businesses and universities. In New England we studied this phenomenon and reported the results as shown in Appendix A mentioned earlier. This included 243 professors and students involved in 175 different contracts with 17 NEIA companies over a 5-year period, for a total contract value of over \$31 million.

The NRC study also independently verified this as quoted below:

“1.3.4 SBIR and the University Connection

SBIR is increasingly recognized as providing a bridge between universities and the marketplace. In the NRC Firm Survey, conducted as a part of this study, over half of respondents reported some university involvement in SBIR projects. Of those companies, more than 80 percent reported that at least one founder was previously an academic.

SBIR encourages university researchers to found companies based on their research. Importantly, the availability of the awards and the fact that a professor can apply for an SBIR award without founding a company, encourages applications from academics who might not otherwise undertake the commercialization of their own discoveries. In this regard, previous research by the NRC has shown that SBIR awards directly cause the creation of new firms, with positive benefits in employment and growth for the local economy.”³⁴

XI. Spurring Innovation and Job Creation

The SBIR/STTR Programs are a “Perfect Solution” to the “Perfect Storm” of Financial Challenges Facing SBIR and STTR Companies – and The U.S. Economy:

SBTC believes that the Committee's title for this hearing is especially germane in today's financial and budgetary climate.

The financial challenges facing the small SBIR/STTR companies have peaked into a “Perfect Storm” of financial problems affecting our economy. The SBIR/STTR programs have become the “financing of last resort” as described in the next sections.

And, with the budgetary challenges facing this Congress and the Administration, the demonstrated high efficiency of SBIR/STTR companies in producing extraordinarily high numbers of patents, innovations and jobs, make these programs especially valuable to our country and taxpayers at this time in our Nation's history.

As Congress and the Administration address the budgetary and deficit challenges of our nation, it is clear that the most efficient use of taxpayers' dollars is paramount. From the data we presented

earlier, it is clear that small businesses and the SBIR/STTR programs are the most efficient way to convert Federal R&D dollars into patents, innovations, products and jobs – here in America.

We urge the Committee to consider this financial factor in reauthorization deliberations.

In a November 18, 2010 WSJ article, authors Justin Lahart and Mark Whitehouse provide a very good overview of the challenges facing all small businesses, including SBIR companies (Appendix L). They state:

"Fewer new businesses are getting off the ground in the U.S., available data suggest, a development that could cloud the prospects for job growth and innovation. Research shows that new businesses are the most important source of jobs and a key driver of the innovation and productivity gains that raise long-term living standards. Without them there would be no net job growth at all, say economists John Haltiwanger of the University of Maryland and Ron Jarmin and Javier Miranda of the Census Bureau. "Historically, it's the young, small businesses that take off that add lots of jobs," says Mr. Haltiwanger. "That process isn't working very well now."

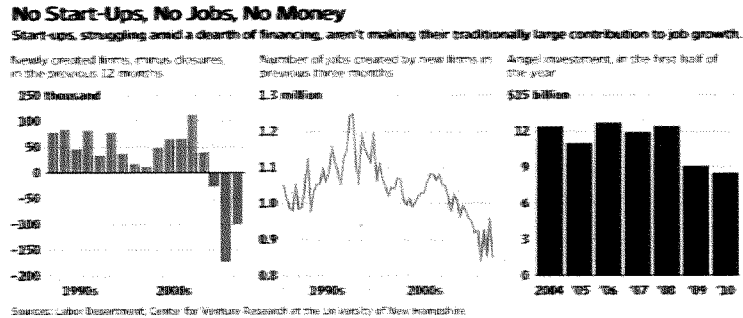
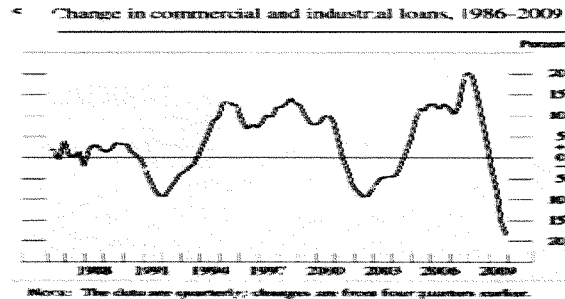


Figure 5. Charts from Appendix N

XII. The Important Financing Challenges All Small Businesses, Including SBIR/STTR Companies, Face in Today's Recession. In a recession, small businesses are hit the hardest during the ensuing credit crunch. In the 1991 recession, banks had a net negative lending to businesses – meaning they pulled more loans than they made.³⁵ This is also true in the current recession as shown in Figure 6 of the Federal Reserve Bulletin below.

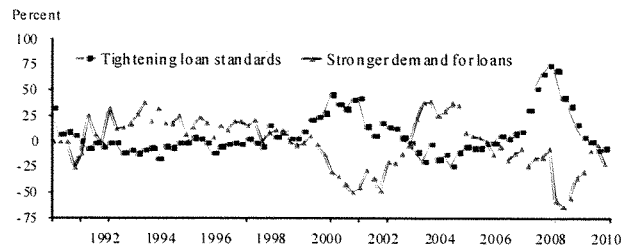
Figure 6. Federal Reserve Bank Report on All Commercial and Industrial Loans



This credit crunch is also hitting small businesses as shown in Figure 7 and Figure 8 below.³⁶ These charts are from the Office of Advocacy, US Small Business Administration research: *The Economy During the 1990s*, and were presented at the *Innovations in Economic Development Forum* in Atlanta on February 2, 2010.

Figure 7. Small Business Bank Lending 1991 to 2010.

Small Business Bank Lending, 1991-2010



Note: Change in percentage of respondents from the previous period.

Source: Office of Advocacy, U.S. Small Business Administration from data provided by the Federal Reserve Board Senior Loan Officer Survey.



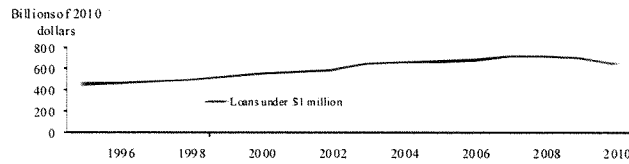
Businesses

Employment

Finance

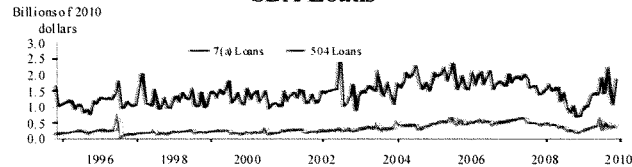
Figure 8. Small Business Loans (under \$ 1 million) and SBA Loans

Small Business Loans



Source: Federal Reserve Board, Call Report data.

SBA Loans



Source: U.S. Small Business Administration.



Businesses

Employment

Finance

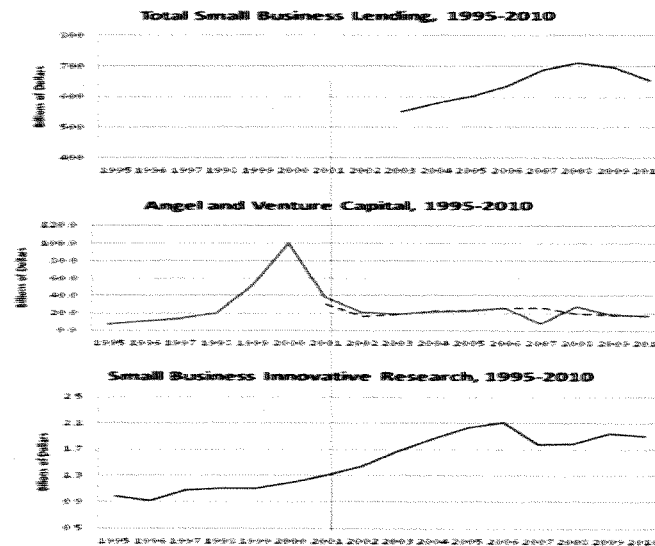
The Office of Advocacy, US Small Business Administration, just released on February 11, 2011, their annual banking study, *Small Business Lending in the United States, 2009-2010*.³⁷ The report summary states:

“U.S. gross domestic product has increased since second quarter 2009; however, small business lending by depository institutions continues to decline. This decline reflects the challenges posed by an uncertain economy in which small business owners are reluctant to acquire more debt, lenders are cautious about extending more debt, and regulators are carefully watching the performance of all out-standing debt. The aggregate value of small business loans held by depository institutions declined by 6.2 percent from \$695.2 billion in 2009 to \$652.2 billion in 2010.”

A further Office of Advocacy release on February 13, 2011 by the Chief Counsel are the Small Business Financing³⁸ charts below in Figure 9 which show the reduction of the most important financing affecting the SBIR/STTR programs: (all in \$ Billions)

1. Total Small Business Lending (1995) 2003 to 2010 showing the steep drop in banking and related lending after 2008.
2. Angel (Blue-dashed line) and Venture Capital Financing (Red line) 1995 to 2010 showing the declines after the dot-com bust of 2000.
3. SBIR funding showing the drop after 2006.

Figure 9. Small Business Financing 1995 to 2010



What these charts show is that SBIR companies are facing the same very discouraging credit market that all small businesses have. This Committee is well familiar with this problem and we applaud your efforts to draft policies that can help turn this problem around.

XIII. Finally, Let's Look at the Importance of the SBIR Program in Financing Small High-Tech Companies – And, How They Leverage Federal R&D Funds to Bring Products to Market. What I'd like to discuss in closing today is that SBIR and STTR companies can and do provide financial leverage to the Federal R&D dollars they receive – something that is not possible on most university projects. The SBIR and STTR programs can provide a very important stimulus to jump start the commercialization of the technologies of the companies awarded contracts. The SBIR and STTR grants/awards are non-dilutive to the shareholders' equity, and are not loans that detract from a company's balance sheet. In fact they are looked on with considerable favor by:

1. Equity investors because the SBIR/STTR program has "vetted" the company's technology through the peer review competitive selection, and because the company has shown an ability to meet the contract/financial/management reporting systems imposed by the programs regulations. In addition, the commercialization plans legislated by Congress and required by all of the SBIR/STTR agencies provide the potential investors with the company's strategies for creating a market for the product.
2. Banks and other financial institutions for lending because of the "solid customer" caliber of the contract with the Federal government, and because of the vetting and reporting requirements and commercialization plans favored by equity investors. In addition, lenders see these contracts as "operations loans" with very low risk since the delivery requirements are research reports and items.
3. Lenders and equity investors when the SBIR/STTR program reaches the Phase III stage because the company is now in commercial production of a product that the lenders and investors have known through the approximate two plus years of Phases I and II. At this stage the commercialization plans are particularly useful because the companies have real customers and market opportunities.

This leverage permits the SBIR/STTR companies to employ more staff than the universities can for the same Federal R&D dollar because universities produce only research reports/items. By their very nature, they do not have marketing and production organizations; therefore, there is no Phase III for their research. The high rate of commercialization reported by GAO and NRC referenced above provides for a direct multiplier on the Federal R&D funds expended on the SBIR and STTR program.

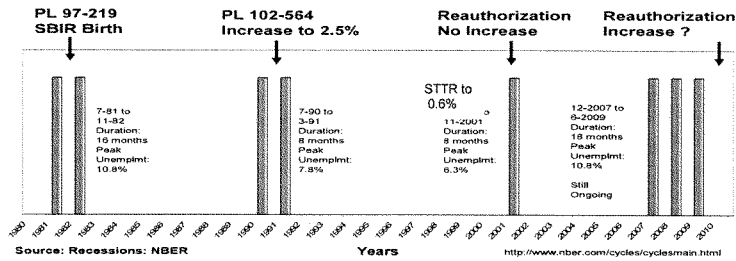
Lastly, this Committee well knows that the small businesses are the most important sector of our economy in creating net new jobs – sorely needed today.

XIV. The SBIR and STTR programs deserve to be reauthorized quickly – perhaps permanently — and their allocation significantly increased. On behalf of the members and Board of SBTC we thank you for holding this very timely hearing. Figure 10 on the page 22 provides a one-page picture of the major factors in why we believe that the SBIR/STTR programs are the "Perfect Solution" to the 2011 "Perfect Storm."

Note 1: We have provided for your information a paper that the “Father of the SBIR Program,” Roland Tibbetts prepared at the beginning of the reauthorization deliberations in 2008 as Appendix M. Roland provides the historical perspective and details of why and how the program was designed and some of the lessons learned from inside the operations of the agencies. This dedicated civil servant was a decorated WWII navigator (Distinguished Flying Cross), venture capitalist, and creator of the SBIR program at NSF. He is an honorary Board member of SBTC. He stands ready to answer any questions the Committee may have.

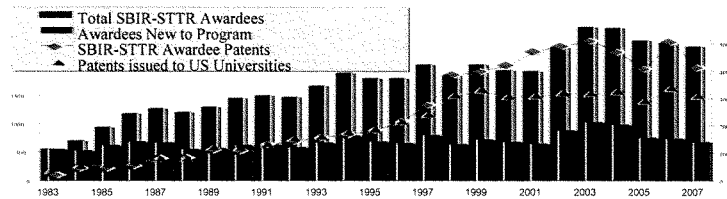
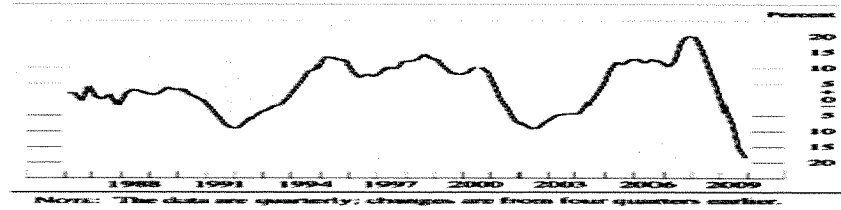
Note 2: A copy of my CV is provided as Appendix N for your information. I, too, stand ready to answer any questions the Committee may have as does SBTC. Normally, we would not provide such a voluminous document in our testimony; however, there are a number of new Congressmembers who may not have any knowledge of the SBIR and STTR programs. The 28+ year history of these programs has a wealth of information that we believed needed to be provided to you and your competent staffs in order for you to make informed decisions in the current economic conditions.

Figure 10. SBIR, “The Perfect Solution” to The 2011 “Perfect Storm”



Recessions and the SBIR Program

5. Change in commercial and industrial loans, 1986–2009



Percent of U.S. Scientists and Engineers Employed in Small Businesses (< 500 employees)		
Year 1978	Year 1993	Year 2005
6%	18%	38%
Percent of Federal R&D \$ = 3.5%	Percent of Federal R&D \$ = 3.8%*	Percent of Federal R&D \$ = 4.3%*
* Includes SBIR and STTR in 1993 and 2005 report of Percent of Federal R&D \$		

Comparison of Federal R&D Dollars Received and Patents Granted

Organizations	Federal R&D Dollars	Patents Granted
Small Business	4 percent	38 percent
Universities	28 percent	3 percent
Large Business	36 percent	55 percent

¹ From Congressman Sam Graves web site: <http://www.house.gov/graves/biography.shtml>

² February 18, 2011, <http://www.whitehouse.gov/the-press-office/2011/02/18/remarks-president-winning-future-hillsboro-oregon>

³ Recession source: NBER Recessions of the Twentieth Century.

⁴ These 1978 hearings showed that, despite their demonstrated superior efficiencies at innovating, small companies received only 3.5% of federal R&D contract dollars. Today, with far more science and engineering talent at their disposal, and a far more widely acknowledged record of innovations, small companies still receive only 4.3% of those R&D contract dollars. And SBIR/STTR accounts for more than half of that. The SBTC Executive Director, Jere W. Glover was Counsel to the House Small Business Committee in 1978 and helped convene this first joint House-Senate Small Business Committee hearing on the subject. SBTC, its Board of Directors, and members have had a very long association with both the SBIR and STTR programs and believe that we provide an experienced and balanced perspective on the program.

⁵ From DoD web site: <http://www.acq.osd.mil/osbp/sbir/overview/index.htm>

⁶ PricewaterhouseCoopers/NVCA MoneyTree;

<https://www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=region>

⁷ Data provided for this testimony by Ann Eskesen, President of Innovation Development Institute (IDI), Swampscott, MA, 2011, the best and most comprehensive source of SBIR data.

⁸ *An Assessment of the Small Business Innovation Research Program*, National Research Council, National Academies Press; Charles W. Wessner, Editor, Committee on Capitalizing on Science, Technology, and Innovation; 2008; see: http://www.nap.edu/catalog.php?record_id=11989

⁹ See: <http://www.wilkinquge.com/roi-approach/pdfs/harvard-business-review-dont-blame-the-metrics.pdf>; and for a popular, non-scientific review, see: http://www.theproduct.com/marketing/product_failure.htm, and <http://www.corpmagazine.com/executives-entrepreneurs/entrepreneurs/itemid/274/winning-the-new-product-innovation-game>

¹⁰ *An Assessment of the SBIR Program*, Op Cit, page 9

¹¹ Ann Eskesen, IDI, op cit.

¹² <http://www.nsf.gov/statistics/seind10/append/c4/at04-07.pdf>

¹³ *A New View of Government, University, and Industry Partnerships*, Jere Glover, then Chief Counsel of the Office of Advocacy, at the Senate Committee on Small Business Roundtable Discussion on the SBIR program on August 4, 1999.

¹⁴ One of the first examples was the March 10, 1982 hearing by the R&D Subcommittee of the House Armed Services Committee on HR-4326, where Stanford University and the American Electronics Association (AEA) both testified against the program, and the Electronic Association of California (a small-business trade association spin-off from AEA) testified in favor of the SBIR program.

¹⁵ Testimony by Jere W. Glover before the Subcommittee on Technology and Innovation, Committee on Science and Technology, United States House of Representatives, 23 April 2009.

¹⁶ National Science Foundation, *Science and Engineering Indicators*, 2007.

¹⁷ *An Assessment of the SBIR Program*, Op Cit, page 50.

¹⁸ See: <http://blog.energy.gov/blog/2010/09/15/boost-small-business>

¹⁹ Personal discussions with the author on March 10, 2011. DNDO is the office of the Department of Homeland Security that is the primary entity in the U.S. government for implementing domestic nuclear detection efforts for a managed and coordinated response to radiological and nuclear threats, as well as integration of federal nuclear forensics programs.

²⁰ Press releases for the Association of University Technology Managers (AUTM) U.S. Licensing Activity Survey Summary: FY-2007 to 2009, average annual funding is \$51.4 billion; average number of patents issued is 3440. See:

http://www.autm.net/AM/Template.cfm?Section=Licensing_Surveys_AUTM&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=6&ContentID=2409

²¹ Data from www.innovation.com the web site for Ann Eskesen, President of Innovation Development Institute, Swampscott, MA, 2011, the best and most comprehensive source of SBIR data. From the program inception in 1982 to date total funding is \$31.8 billion; total number of patents issued is 75,265.

²² AUTM, Op Cit, 2009; R&D funding to universities was \$53.9 billion, and licensing income was \$2.3 billion for 2009.

²³ NRC-Wessner, Op Cit, Page 122, which states: "On average, SBIR projects received almost \$800,000 from non-SBIR sources, with over half of respondents (51.6 percent) reporting some additional funds for

the project from a non-SBIR source." [Since only one-half of the respondents reported receiving additional funds, we have discounted the \$800,000 number in the NRC report to \$400,000. Per the NRC report, the average Phase I plus Phase II funding was approximately \$100,000 plus \$675,000 or \$775,000 during the period of the study.]

²⁴ Office of Advocacy, U.S. Small Business Administration, See: <http://www.sba.gov/advocacy/7495/8420>

²⁵ *Managing University Intellectual Property in the Public Interest*, 2010, Committee on Management of University Intellectual Property: Lessons from a Generation of Experience, Research, and Dialogue; Stephen A. Merrill and Anne-Marie Mazza, Editors; National Research Council, <http://www.nao.edu/catalog/13001.html> Page 68, "Finding 2: The transition of knowledge into practice takes place through a variety of mechanisms, including but not limited to: 1. movement of highly skilled students (with technical and business skills) from training to private and public employment; 2. publication of research results in the open academic literature that is read by scientists, engineers, and researchers in all sectors; . . . 8. licensing of IP to established firms or to new start-up companies."

²⁶ Innovation Development Institute, 2009, from U.S. Patent and Trademark Office data.

²⁷ Fred Block and Matthew Keller, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System 1970-2006*, Information Technology and Innovation Foundation, July 2008.

²⁸ *A New View of Government, University, and Industry Partnerships*, Jere Glover, 2009, Op Cit

²⁹ *Ibid.*, p. 15

³⁰ AUTM, Op Cit, In 2005 and 2006, the reported R&D funding to universities was \$42 billion and \$45 billion respectively.

³¹ <http://www.nsf.gov/statistics/seind10/c8/c8s6o49.htm> For 2005 and 2006 NSF reports that the SBIR funding was approximately \$1.73 billion average per year. It is clear that a "Key Innovation" may take years from the time of research to market impact, but it is proposed that by treating both organizations the same, and since the funding levels were relatively comparably stable over the previous 2 years, the information shown is a reasonable approximation.

³² *An Assessment of the SBIR Program*, Op Cit.

³³ *A New View of Government, University, and Industry Partnerships*, Jere Glover, 2009, Op Cit

³⁴ *An Assessment of the SBIR Program*, Op Cit, page 42.

³⁵ Federal Reserve Bulletin: Profits and Balance Sheet Developments at U.S. Commercial Banks in 2009, Last update: September 2, 2010.

See: <http://www.federalreserve.gov/Pubs/Bulletin/2010/articles/profit/default.htm#fig3>

³⁶ Innovations in Economic Development Forum, Co-sponsored by the Georgia Tech School of Public Policy and the Georgia Tech Enterprise Innovation Institute, Atlanta, GA. Wednesday February 2, 2010. Speaker: Brian Headd, Economist, Office of Advocacy, U.S. Small Business Administration *The Economy During the 1990s*.

³⁷ *Small Business Lending in the United States, 2009-2010*, Office of Advocacy, US Small Business Administration, released on Feb 11, 2011, by Chief Counsel for Advocacy, Dr. Winslow Sargeant. See: http://www.sba.gov/sites/default/files/files/sbl_10study.pdf

³⁸ *Small Business Financing, 1995 to 2010*, Office of Advocacy, US Small Business Administration, released on February 14, 2011, by Chief Counsel, Dr. Winslow Sargeant.

APPENDIX A

New England Innovation Alliance
<http://www.neinnovation.org/NEIA/nea.html>

**Five Years of University
Participation in SBIR/STTR**

A Survey of 17 NEIA members

1 June, 2007

Participating NEIA Companies

- AER
- Aerodyne
- AFR
- AnthroTronix
- Delsys
- Dynamet
- EIC
- FarSounder
- Inflexxion
- MSI
- ProChange
- PSI
- RMD
- SSI
- SSCI
- Triton
- Visidyne

Total of 101 Universities Cited

- MIT (8)
- U of Connecticut (7)
- Harvard University (5)
- Boston University (5)
- UMass/Lowell (4)
- SUNY (4)
- Brown University (3)
- Northeastern U (3)
- Georgia Tech (3)
- UC/Berkley (3)
- Rice University (3)
- U of Arizona (3)
- Princeton (3)
- Purdue (3)
- Johns Hopkins (3)
- 20 others (2)
- 66 others (1)

Total Dollars Subcontracted

- 175 separate subcontracts to universities
- \$28,124,005 subcontracted to universities
- 243 professors and grad students involved
- \$3,108,700 additional to professors

Faculty Involvement in NEIA Companies

- Founders included 9 faculty members
- 49 members of tech staff formerly held academic positions
- 45 professors are part-time employees or consultants
- 33 grad students on SBIRs were hired
- 25 employees are adjunct professors at universities

APPENDIX B

Findings and Purposes of PL 97-219
<http://www.history.nih.gov/research/downloads/PL97-219.pdf>

PUBLIC LAW 97-219 Signed JULY 22, 1982

Public Law 97-219, 97th Congress

An Act

To amend the Small Business Act to strengthen the role of the small, innovative firms in federally funded research and development, and to utilize Federal research and development as a base for technological innovation to meet agency needs and to contribute to the growth and strength of the Nation's economy.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. This Act may be cited as the "Small Business Innovation Development Act of 1982".

SEC. 2. **(a)** The Congress **finds** that-

- (1) technological innovation creates jobs, increases productivity, competition, and economic growth, and is a valuable counterforce to inflation and the United States balance-of-payments deficit;
- (2) while small business is the principal source of significant innovations in the Nation, the vast majority of federally funded research and development is conducted by large businesses, universities, and Government laboratories; and
- (3) small businesses are among the most cost-effective performers of research and development and are particularly capable of developing research and development results into new products.

(b) Therefore, the **purposes** of the Act are-

- (1) to stimulate technological innovation;
- (2) to use small business to meet Federal research and development needs;
- (3) to foster and encourage participation by minority and disadvantaged persons in technological innovation; and
- (4) to increase private sector commercialization innovations derived from Federal research and development.

APPENDIX C

<http://thomas.loc.gov/cgi-bin/query/F?c102:4:./temp/~c1020B9ao8:e44878:>

H.R.4400

**Small Business Innovation Development Amendment Act of 1992
(Reported in House - RH)**

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS- Congress finds that--

- (1) the Small Business Innovation Research Program established by the Small Business Innovation Development Act of 1982 has been effective in encouraging the participation of small businesses in Federal research and development;**
- (2) the Small Business Innovation Research Program has stimulated technological innovation by small businesses participating in the program;**
- (3) small businesses participating in the Small Business Innovation Research Program have demonstrated that they are among the most competent and cost-effective providers of high quality research and development;**
- (4) small businesses participating in the Small Business Innovation Research Program have provided innovative products and services which are vital to the national defense, the exploration of space, the advancement of science, the promotion of the health, safety, and welfare of United States citizens, and many other fields important to the functions of the Federal Government;**
- (5) the Small Business Innovation Research Program has been successful in converting Federal research and development into innovative products benefiting both the United States Government and the commercial marketplace;**
- (6) by moving technology from the laboratory to the marketplace, the Small Business Innovation Research Program has expanded business opportunities, increased productivity, created jobs, stimulated the introduction of new products by high technology-related firms, and made United States industry more competitive;**
- (7) the Small Business Innovation Research Program has also resulted in a positive benefit to the Nation's balance of trade by increasing exports from small businesses;**

(8) Federal employees have exhibited skill and innovation in implementing the Small Business Innovation Research Program;

(9) the Small Business Innovation Research Program can provide productive employment to the Nation's scientists and engineers who have been displaced due to cuts in the budget of the Department of Defense and due to economic recession; and

(10) despite the fact the Small Business Innovation Research Program has achieved its participation goals, the proportion of Federal funds for industrial research and development received by small businesses remains at 3 percent (the same level as 10 years ago), although private sector use of small businesses for research and development doubled in the 1980's.

(b) PURPOSES- *The purposes of this Act are--*

(1) to expand and improve the Small Business Innovation Research Program;

(2) to modify the Small Business Innovation Research Program to emphasize private sector commercialization of technology derived from Federal research and development; and

(3) to increase the opportunity for participation in Federal research and development by small businesses.

APPENDIX D

**Small Business Technology Council of the National Small Business Association
1156 15th Street NW, Suite 1100, Washington, DC 20005**

The SBIR Program – It Is Working!

The SBIR program is now 28 years old, with tens of thousands of awards and many studies. What are the conclusions? How is it being used by the SBIR agencies? Is it successful in the commercialization of advanced technology? Is it being copied anywhere else in the world? Is it relevant in today's economy?

- The most recent and most intensive study was a six-year analysis by the prestigious National Research Council of the National Academies published in 2008 by National Academies Press,¹ which concluded:
 “By strengthening the SBIR program, the Committee believes that the capacity of the United States to develop innovative solutions to government needs and promising products for the commercial market will be enhanced.” (Paragraph 1.6, page 53)
- SBIR companies have produced approximately 25% of key innovations in the past 10 years—with only 2.5% of the Federal R&D extra-mural budget.² The 11 agencies participating in the SBIR program have adapted the SBIR program to their particular missions with considerable success. (A Google search of “SBIR Success Stories” provides over 30,000 returns.) See SBIR Success Stories at www.sbtac.org.
- The commercialization success of the SBIR program is unparalleled in Federal R&D programs with its focus on the Phase III production outcome. According to the NAP study, “. . . approximately 30-40 percent of projects generate products that do reach the marketplace.” (Page 129) This is further exemplified by the very high rate of patents generated by SBIR firms compared to universities and large businesses – 38% of U.S. patents for small business (with < 4% of the Federal R&D budget); 3% for universities (with 28% of the budget); and 55% for large businesses (with 36% of the budget).³ For universities, it is “publish or perish.” For small businesses, it is “patent and produce products or perish.” These commercialization efforts produce products, jobs and tax revenue to help pay for our universities.
- The NAP study also found that the following countries have adopted an SBIR-type program – Sweden, Russia, The United Kingdom, The Netherlands, Japan, Korea, Taiwan and other Asia countries (Page 54). A European Union policy paper has a goal of 15% of EU R&D funding to SMEs.⁴
- Further, the NAP study found that the SBIR program builds meaningful bridges to universities:
 “. . . about a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself

¹ *An Assessment of the Small Business Innovation Research Program*, National Research Council, National Academies Press; Charles W. Wessner, Editor, Committee on Capitalizing on Science, Technology, and Innovation; 2008; http://www.nap.edu/catalog.php?record_id=11989

² *Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006*, published by THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, Washington, DC July 2008.

³ *A New View of Government, University, and Industry Partnerships*, This paper was submitted by Jere Glover, Chief Counsel of the Office of Advocacy, at the Senate Committee on Small Business Roundtable Discussion on the SBIR program on August 4, 1999.

⁴ http://cordis.europa.eu/fp7/home_en.html

in developed technologies. (Page 64) . . . These data underscore the significant level of involvement by universities in the program and highlight the program's contribution to the transition of university research to the marketplace." (Page 65)

- SBTC believes that this partnership between universities and small business is an important economic multiplier that is unique to the U.S. innovation strategy. We have always strongly supported this partnership throughout the entire 28-year history of the program.⁵ We see the important successes that these strong university/small business partnerships have created in Silicon Valley, Route 128, San Diego, Research Triangle Park, Ann Arbor, and others across the country. The U.S. needs more such programs.
- The importance of these partnerships is reinforced by the NAP study of 2002, wherein they state:

"Public-private partnerships, involving cooperative research and development activities among industry, government laboratories, and universities, can play an instrumental role in accelerating the development of new technologies from idea to market."⁶
- U.S. universities have produced 119 Nobel Laureates in the past 25 years, and they graduate the brilliant scientists and engineers that our innovative companies need. Small companies introduce the innovative products to the marketplace that keeps the U.S. in the forefront of technology. We need this partnership.

⁵ *A New View of Government, University, and Industry Partnerships*, op. cit.

⁶ *Government-Industry Partnerships for the Development of New Technologies*, National Research Council, National Academies Press: Charles W. Wessner, Editor; 2002, page 23; <http://www.nap.edu/catalog/10584.html>

APPENDIX E

SBIR-STTR VERSUS VENTURE CAPITAL INVESTMENTS IN HOUSE COMMITTEE ON SMALL BUSINESS MEMBER STATES

112th Congress, House Small Business Committee: Republicans

Extent and Form of SBIR-STTR activity and participation.
Organized By Congressional District of Small Business Committee Members

Committee Members	SBIR-STTR Data over life of program 1983-present						Currently Active			
	State	District	Total Awarded	Total SBIR-STTR Awards		VC funded Firms	Total Awarded	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***
				Phase I	Phase II**			Phase I***	Phase II***	
Sam Graves	MO	8th	4	12	2	\$1,764,473	0	2	0	\$166,763
Roscoe Bartlett	MD	8th	42	176	55	\$54,728,575	4	4	7	\$15,382,854
Steve Chabot	OH	1st	34	145	40	\$50,052,172	1	10	23	\$43,682,352
Steve King	IA	5th	6	6	2	\$2,395,114	0	1	1	\$723,154
Mike Coffman	CO	8th	69	471	139	\$173,305,118	3	17	34	\$30,988,836
Mark Mulkern	SC	5th	6	15	8	\$5,029,639	0	1	2	\$735,742
Scott Tipton	CO	3rd	16	43	15	\$12,788,414	0	4	6	\$2,689,542
Chuck Fleischmann	TN	3rd	46	251	113	\$86,289,043	0	9	29	\$11,822,642
Jeff Landry	LA	3rd	4	49	7	\$5,955,515	0	2	2	\$766,162
Jane Harbeck Smith	MA	3rd	22	83	42	\$32,103,756	1	10	26	\$43,067,237
Allen West	FL	23rd	31	65	22	\$21,275,507	2	5	3	\$4,126,410
Renee Elmers	NC	2nd	18	39	9	\$17,381,220	0	5	4	\$4,257,385
Joe Walsh	IL	8th	34	72	29	\$26,076,666	2	7	10	\$4,542,775
Totals			332	1,438	542	\$436,683,404	13	77	203	\$102,278,854

** In compilation of these type of aggregate data analysis, "Currently Active" refers to any firm in receipt of an SBIR-STTR Phase I award in the passed three years. It is common that many convert to Phase II up to three-four years following the Phase I award. In practical terms, there may be any number of reasons why a particular company may not in fact be currently SBIR-funded. They applied for - but were not selected - for Phase II. They have outgrown SBIR funding (imitations, been acquired, etc.). Nonetheless, as an indicator of the form of SBIR participation in a particular region, the aggregate approach is useful.

*** Typically, we take previous FYE year period as current Phase I. Work on those funded projects is likely still to be ongoing. Later year projects (post 2005) should always properly considered as all part of SBIR-STTR active pool. It can be assumed that in the next year or two, several more Phase I projects will continue into the more sophisticated work that is Phase II. Always in FYE due to lesser extent also in 2003. Phase I awards are processed incrementally over two-three years. It can be assumed that even within more Phase I or Phase II a made - not all projects; total award dollars will increase, probably quite substantially.

Source: Innovation Development Institute, Germantown, MA. Copyright 2011. All Rights Reserved

112th Congress, House Small Business Committee: Democrats

Extent and Form of SBIR-STTR activity and participation.
Organized By Congressional District of Small Business Committee Members

Committee Members	SBIR-STTR Data over life of program 1983-present						Currently Active			
	State	District	Total Awarded	Total SBIR-STTR Awards		VC funded Firms	Total Awarded	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***
				Phase I	Phase II**			Phase I***	Phase II***	
Nydia M. Velázquez	NY	12th	5	11	5	\$4,118,295	0	3	1	\$544,773
Kurt Schrader	OR	5th	47	113	42	\$32,577,259	1	6	4	\$2,527,152
Mark Critz	PA	12th	17	54	19	\$18,412,594	2	4	10	\$6,701,845
Jason Altmire	PA	4th	78	212	74	\$71,354,322	13	15	30	\$11,857,297
Nicole Clarke	NY	11th	12	76	22	\$28,001,418	2	8	15	\$12,562,710
Judy Chu	CA	32nd	24	110	32	\$29,402,750	2	11	21	\$5,205,728
David C. Bonior	RI	1st	51	153	65	\$85,186,043	5	15	20	\$15,007,303
Cedric Richmond	LA	2nd	13	34	12	\$11,125,479	1	3	3	\$2,740,355
Gary Peters	MI	9th	52	114	52	\$42,430,237	1	11	12	\$5,881,205
Bill Owens	NY	23rd	9	26	12	\$4,745,650	0	2	2	\$1,872,142
William Keating	MA	10th	46	294	95	\$73,642,750	2	12	28	\$7,422,301
Totals			354	1,215	430	\$386,327,800	29	82	159	\$74,622,809

** In compilation of these type of aggregate data analysis, "Currently Active" refers to any firm in receipt of an SBIR-STTR Phase I award in the passed three years. It is common that many convert to Phase II up to three-four years following the Phase I award. In practical terms, there may be any number of reasons why a particular company may not in fact be currently SBIR-funded. They applied for - but were not selected - for Phase II. They have outgrown SBIR funding (imitations, been acquired, etc.). Nonetheless, as an indicator of the form of SBIR participation in a particular region, the aggregate approach is useful.

*** Typically, we take previous FYE year period as current Phase I. Work on those funded projects is likely still to be ongoing. Later year projects (post 2005) should always properly considered as all part of SBIR-STTR active pool. It can be assumed that in the next year or two, several more Phase I projects will continue into the more sophisticated work that is Phase II. Always in FYE due to lesser extent also in 2003. Phase I awards are processed incrementally over two-three years. It can be assumed that even within more Phase I or Phase II a made - not all projects; total award dollars will increase, probably quite substantially.

Source: Innovation Development Institute, Germantown, MA. Copyright 2011. All Rights Reserved

APPENDIX F

Useful data synthesizing

**Extent and Form of SBIR-STTR
participation in the relevant
States and Specific Districts of
Members of the 112th Congress
House Small Business Committee**



Innovation Development
45 Beach Bluff Avenue Suite 300
Swampscott, MA 01907-1542
Voice: (781) 595-2920
web: mknowvation.com



Useful data synthesizing

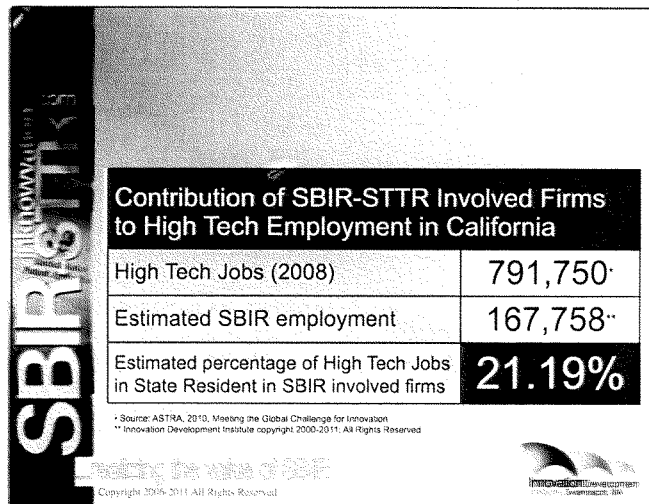
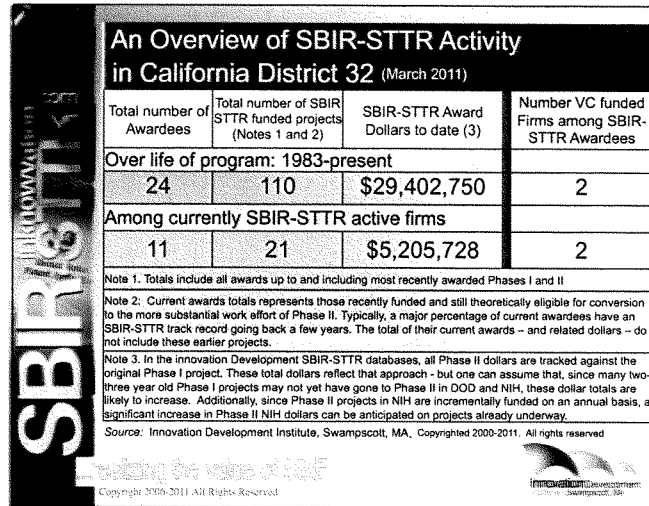
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participation in the relevant
States and Specific Districts of
Members of the 112th Congress
House Small Business Committee

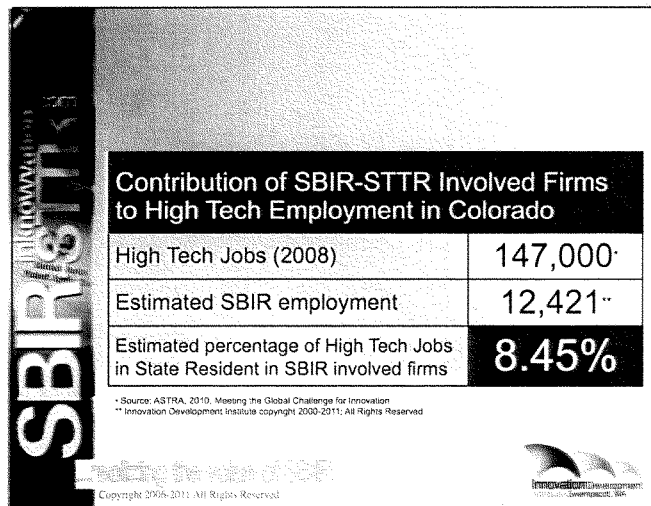
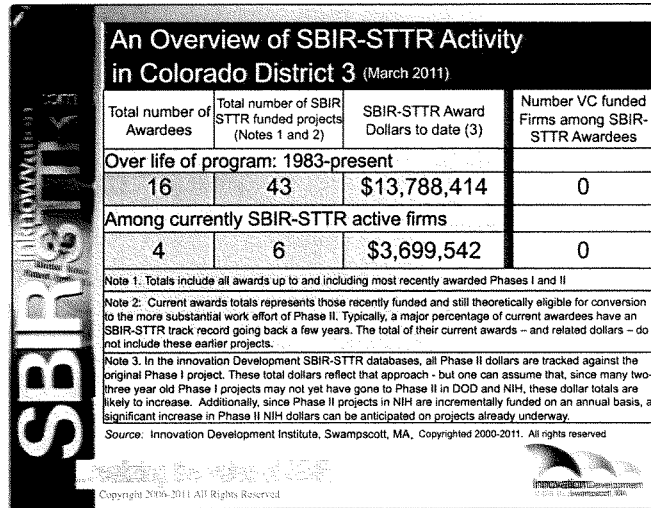
Ann Eskesen, President
Innovation Development Institute
March 8, 2011

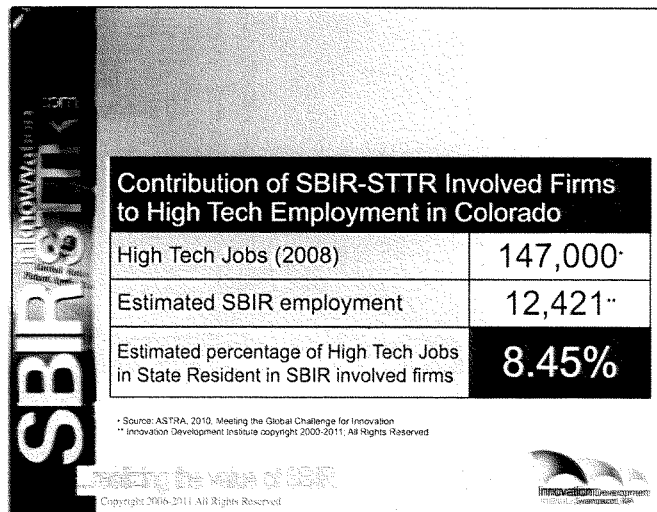
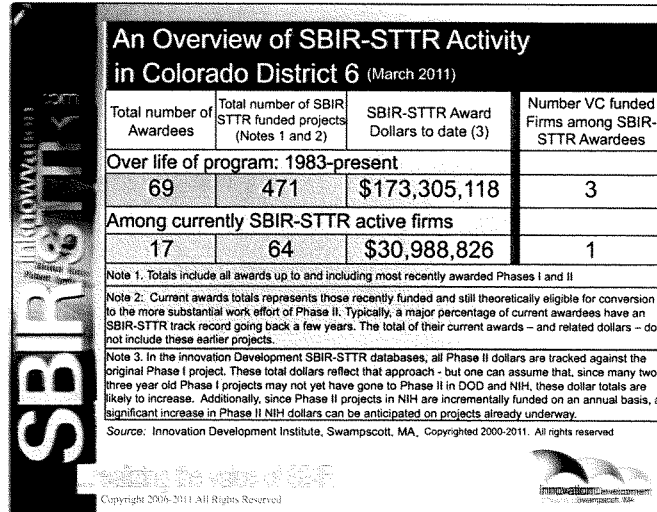
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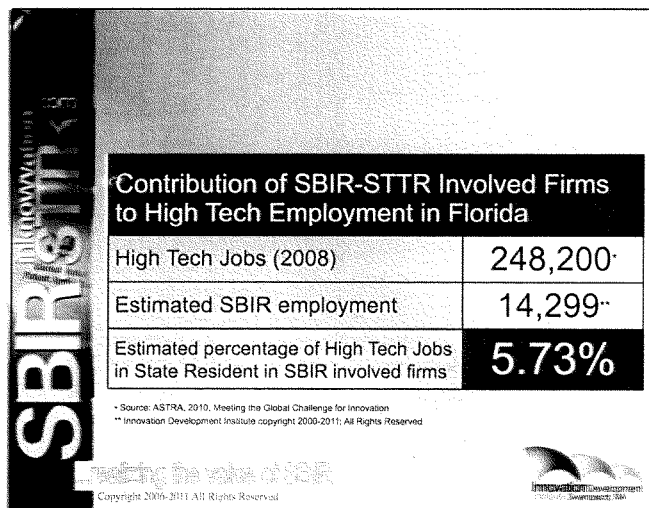
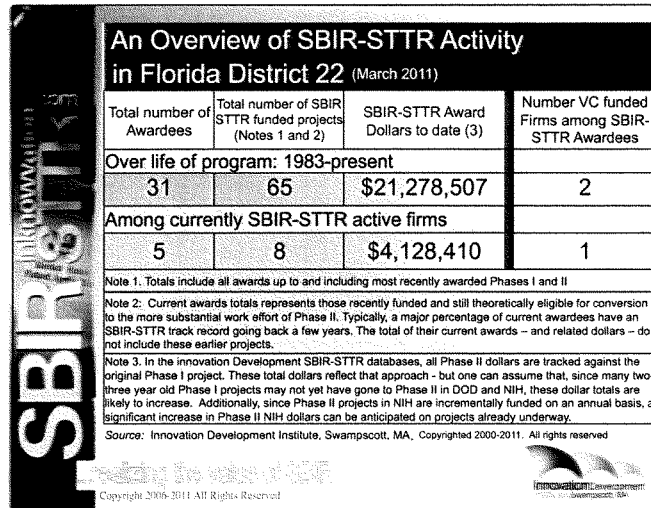
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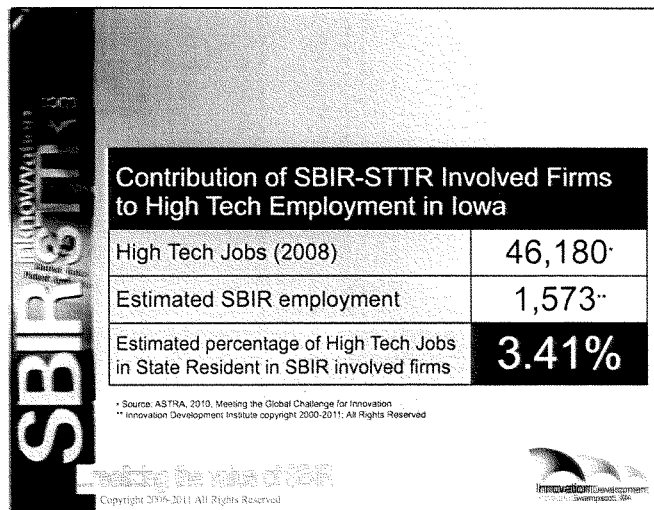
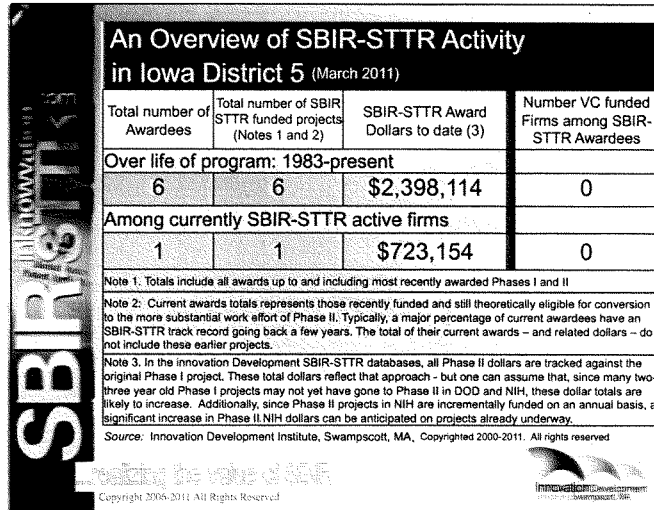
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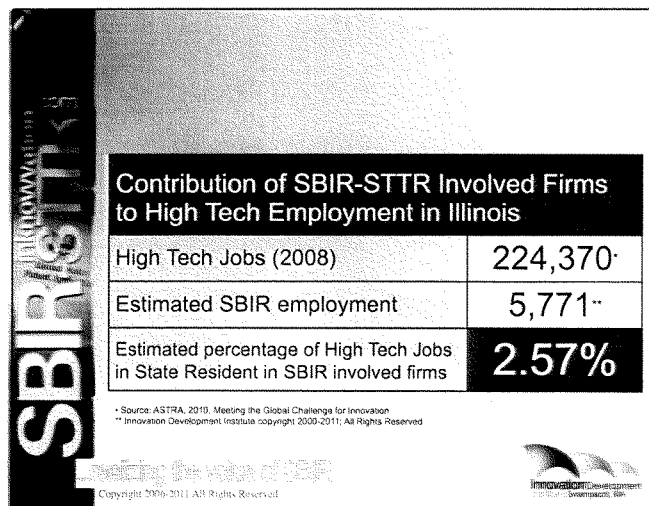
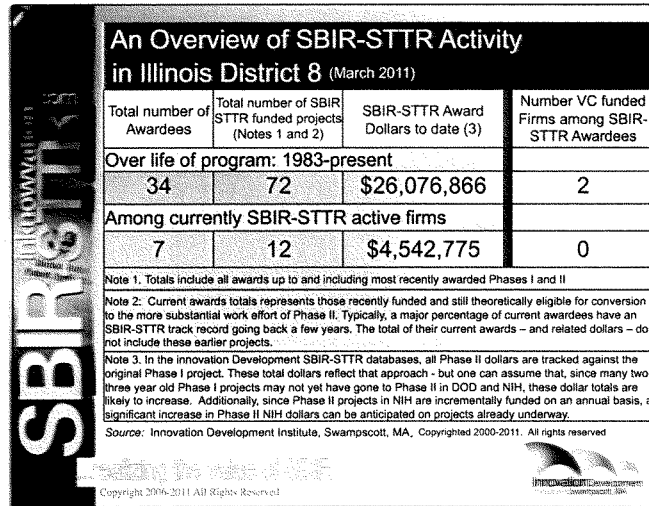


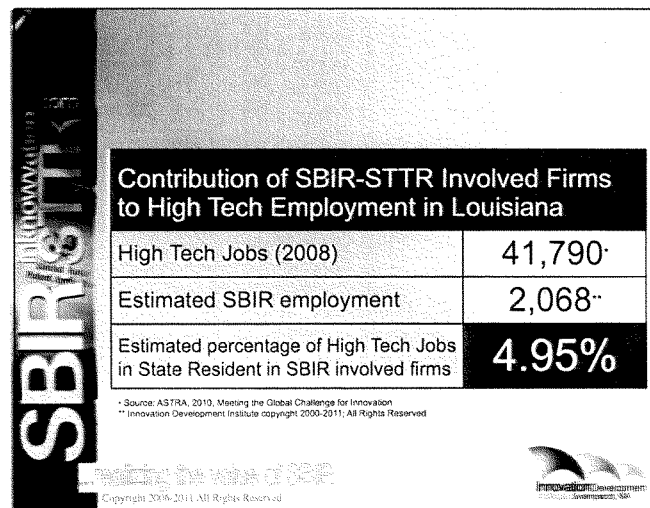
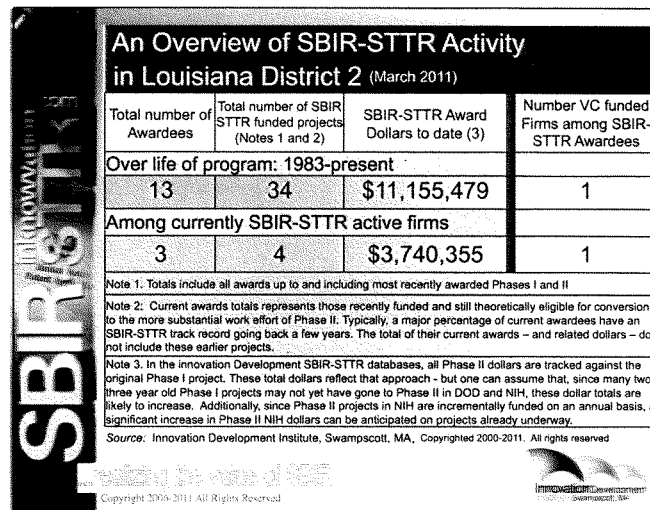


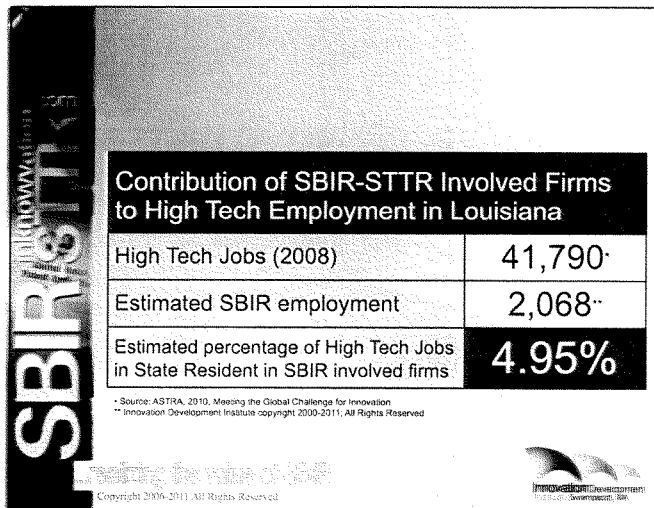
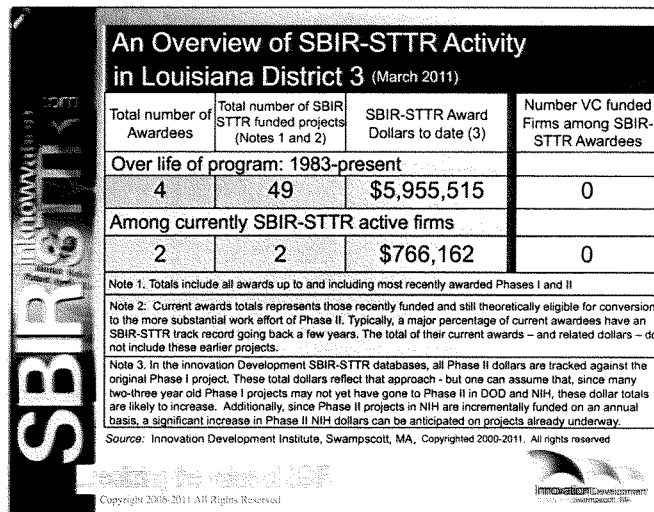


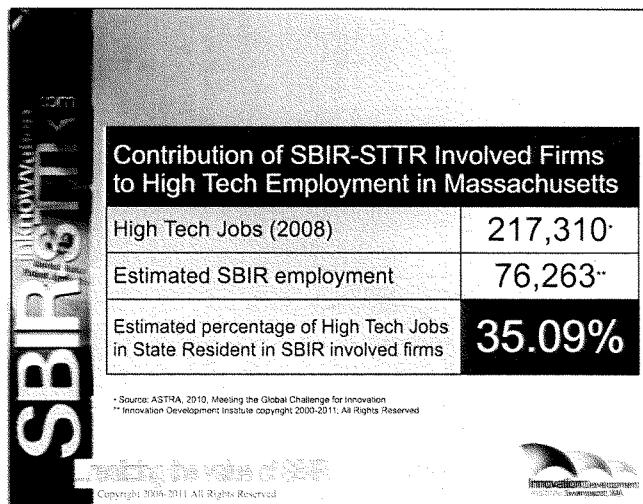
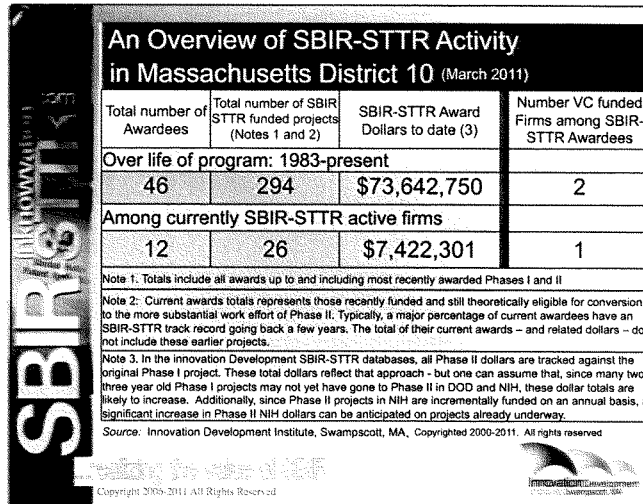


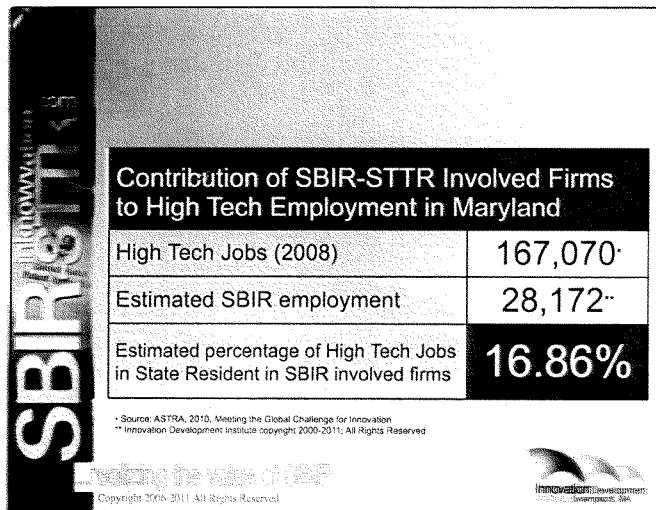
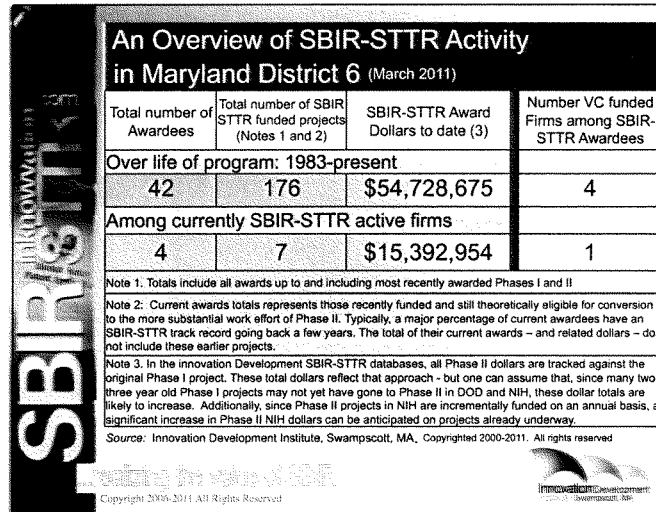


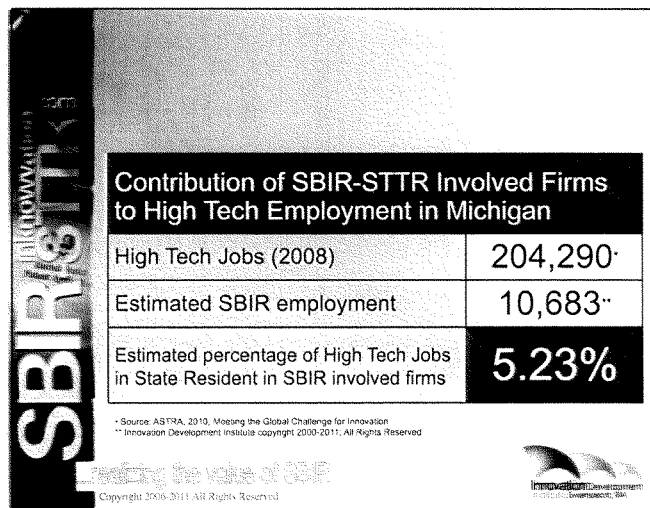
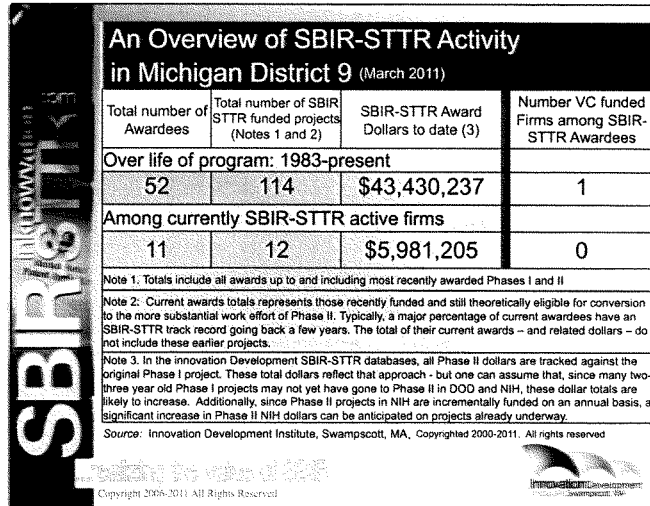


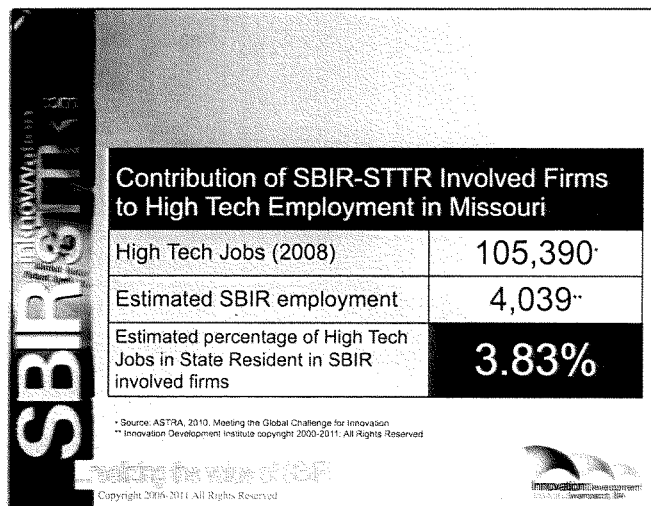
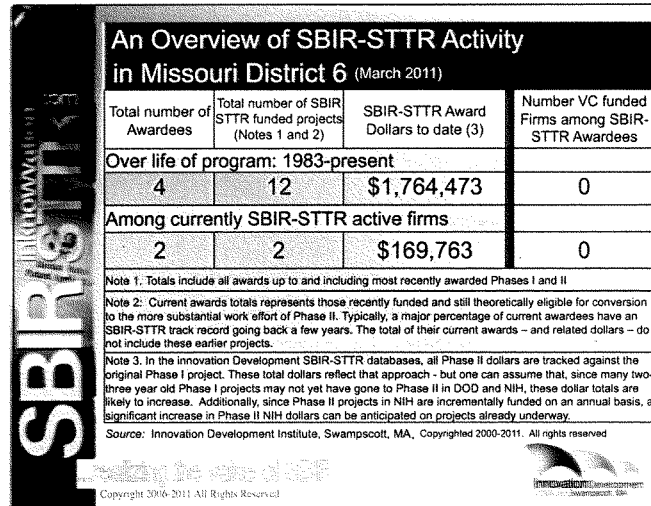


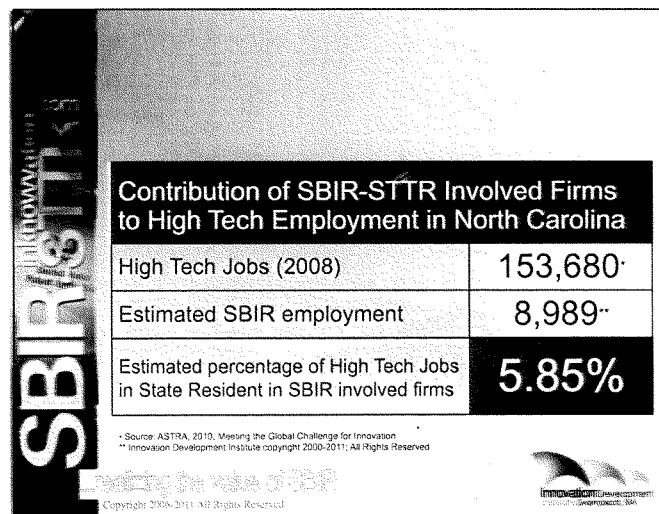
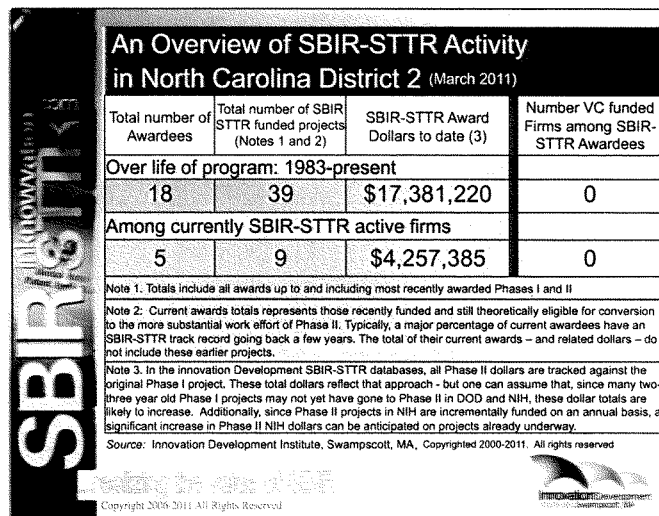


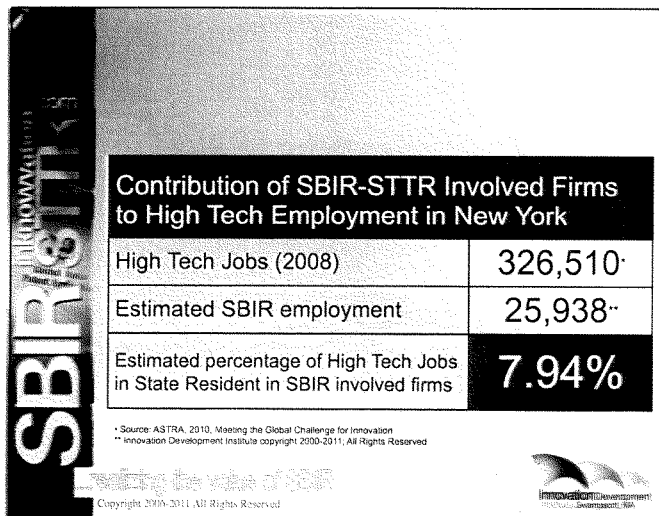
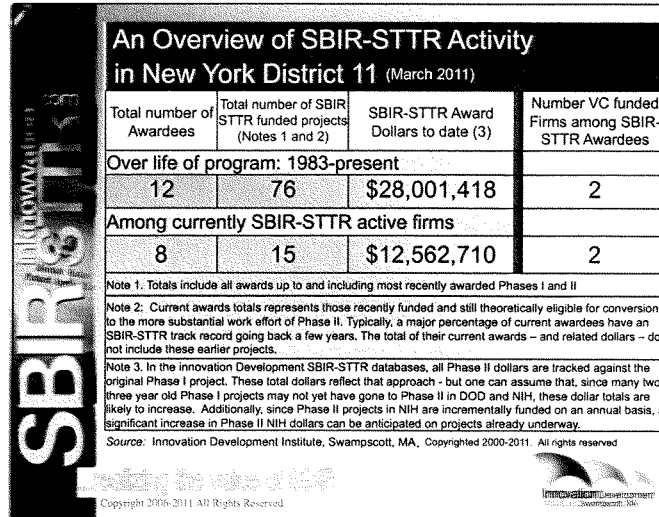


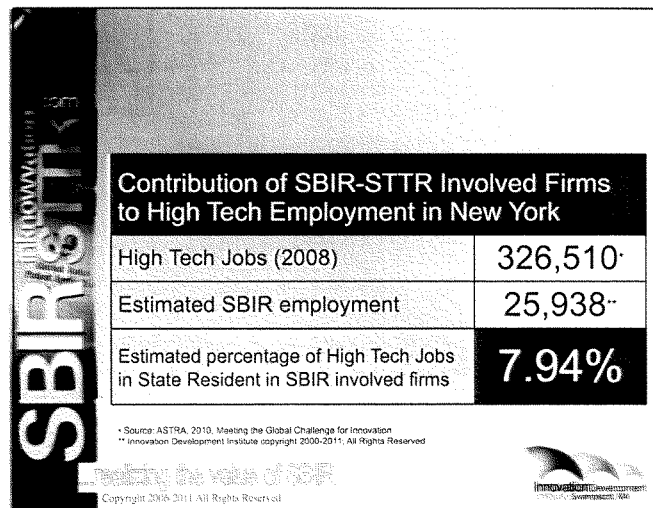
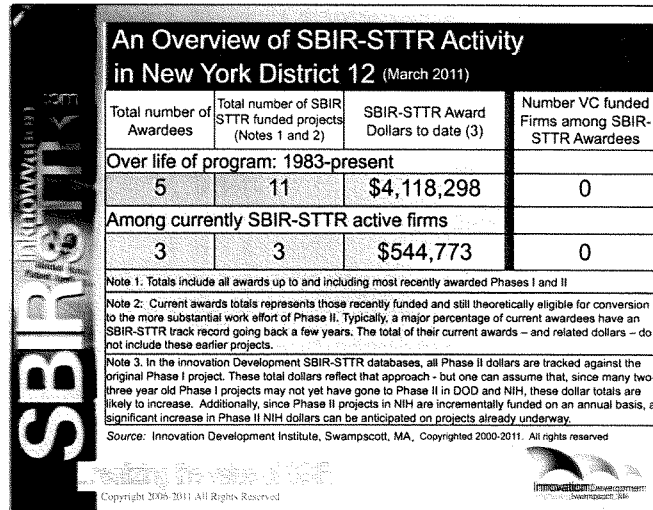


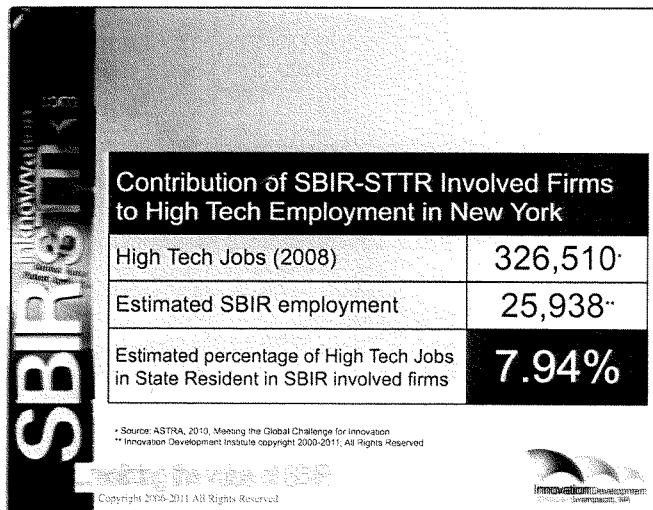
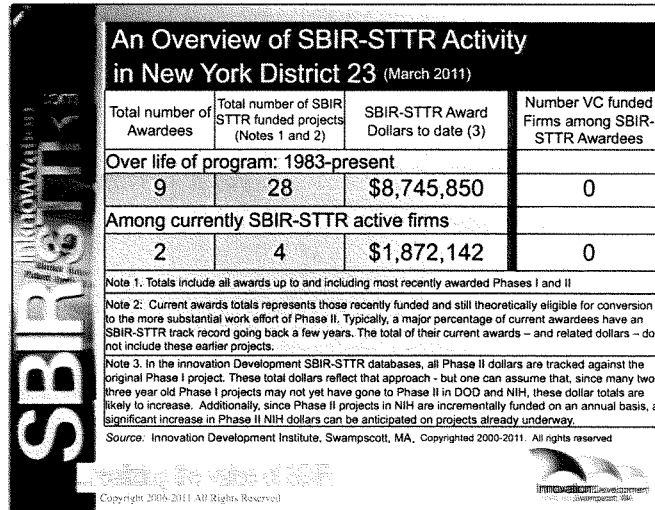


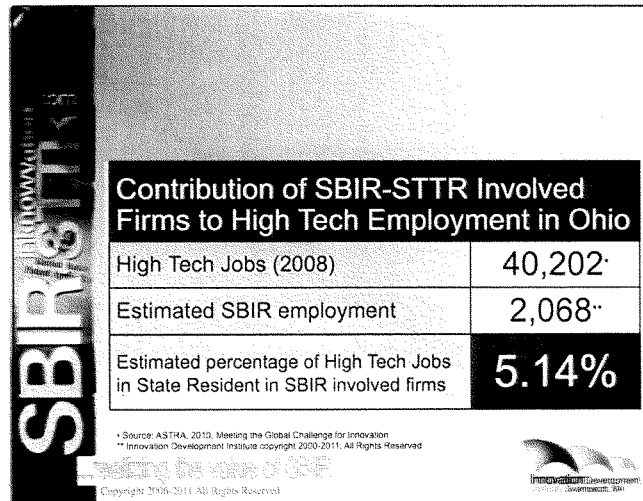
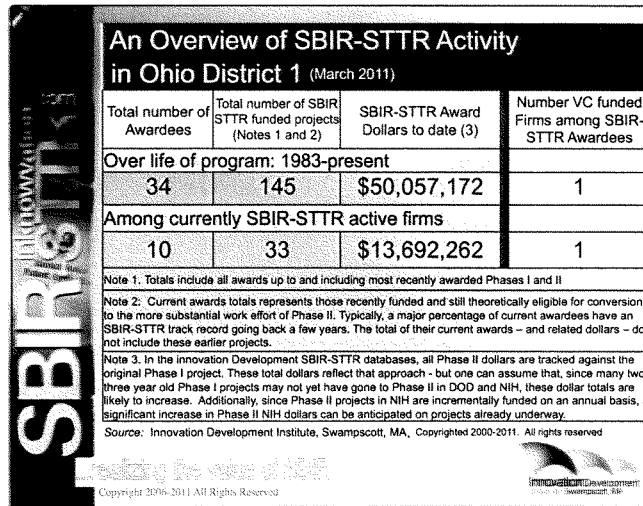


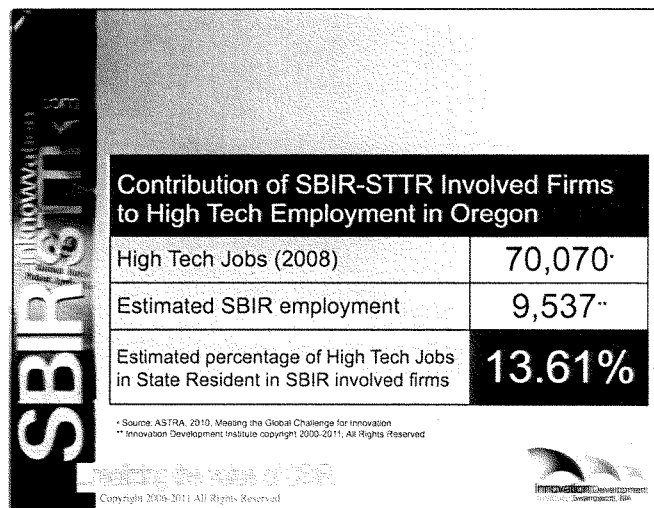
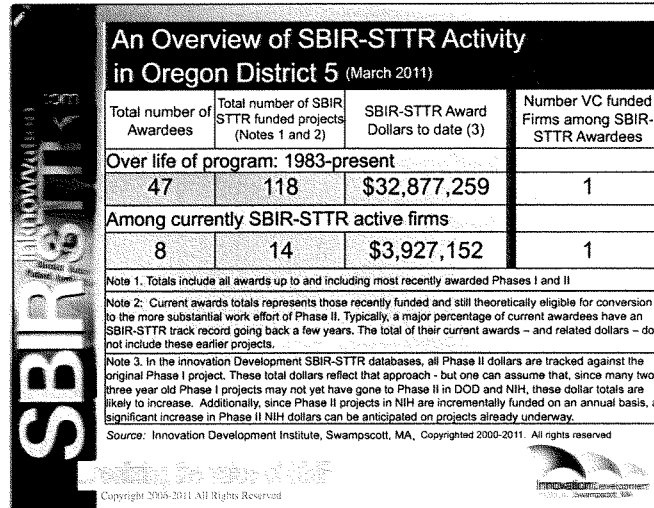


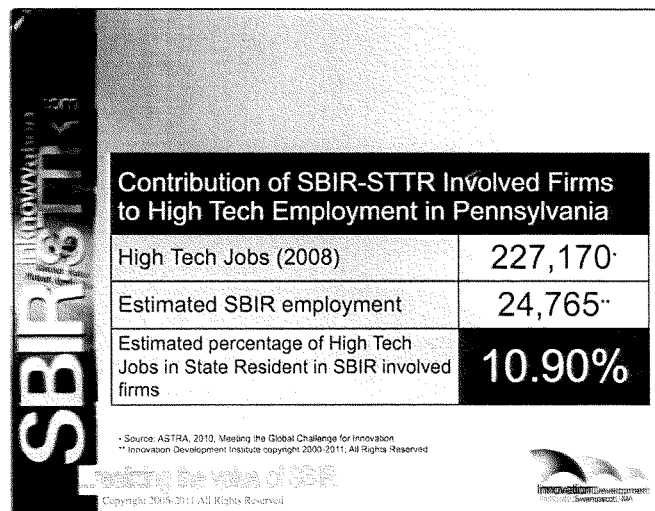
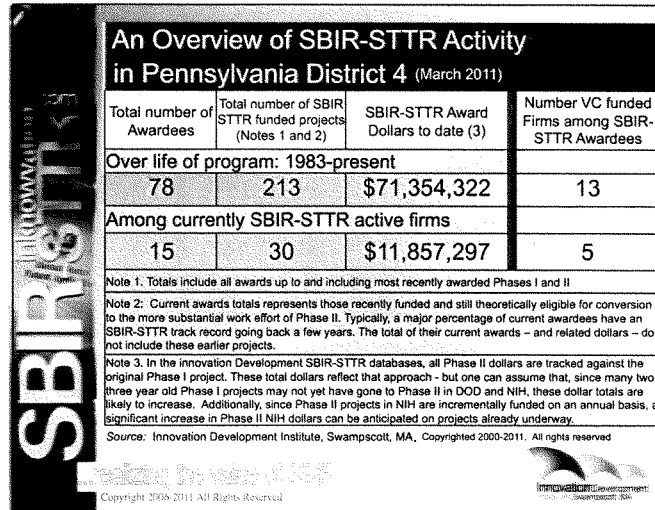


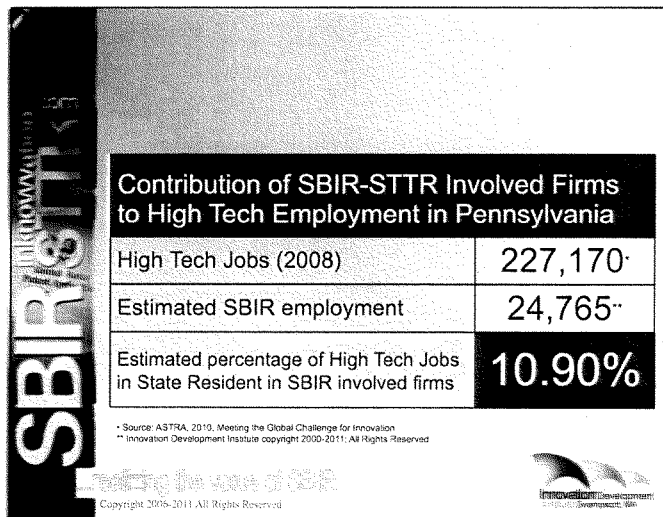
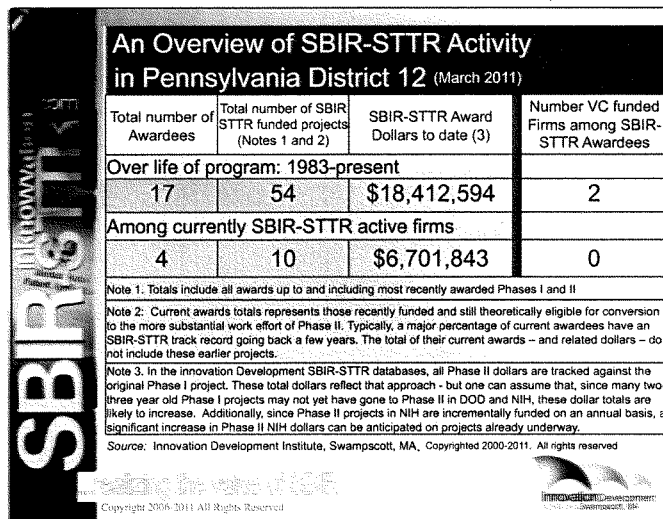


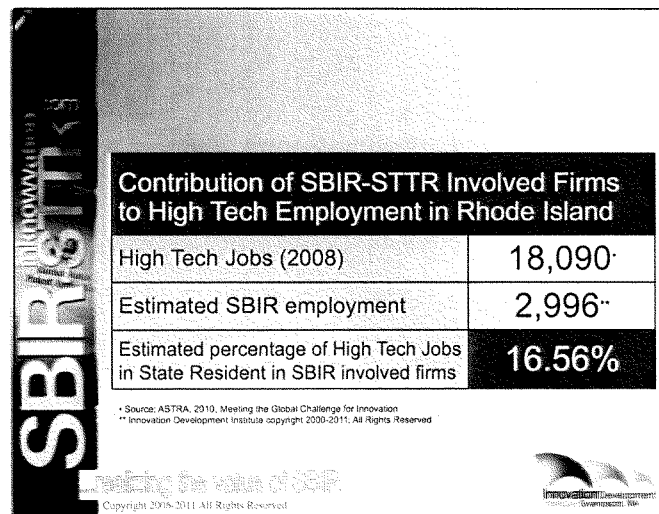
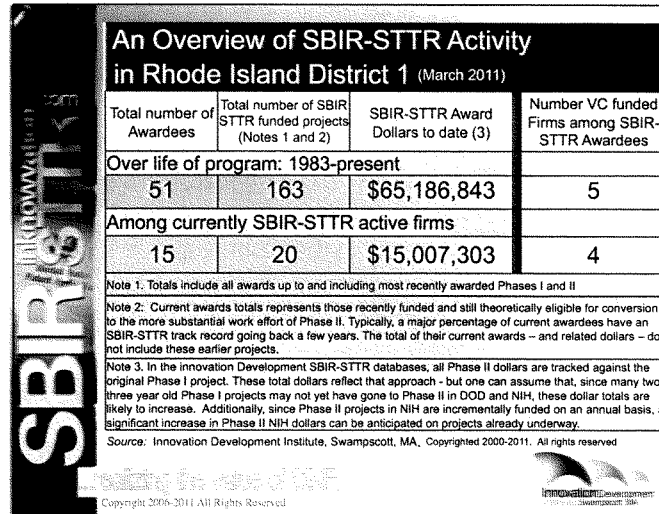


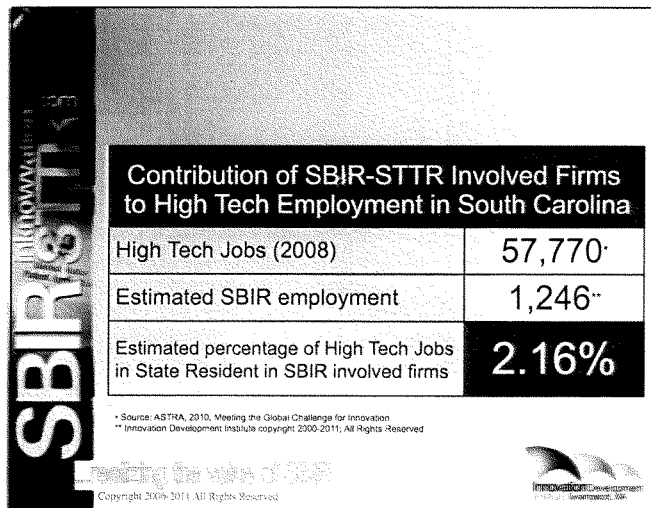
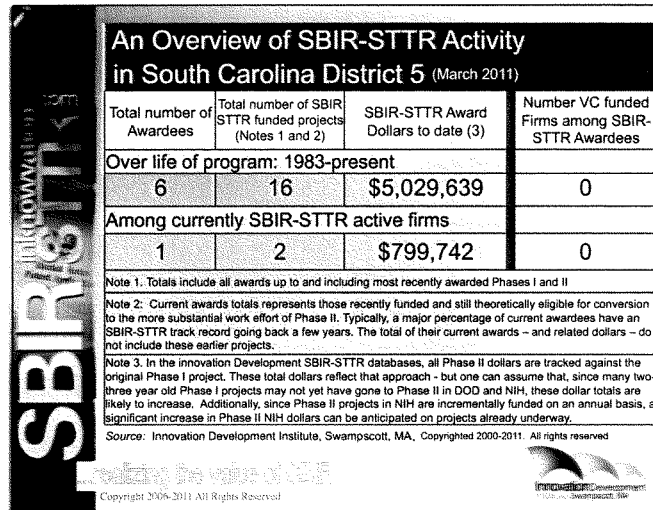


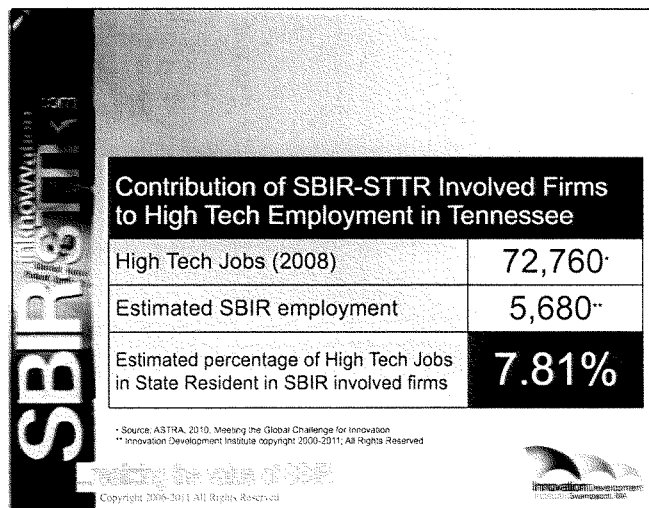
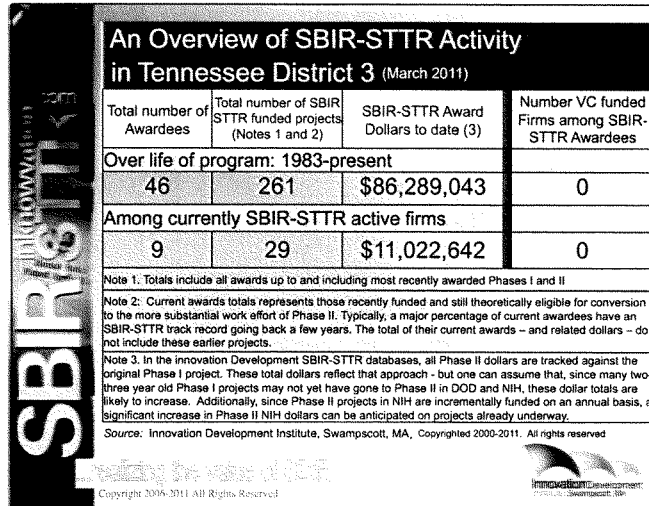


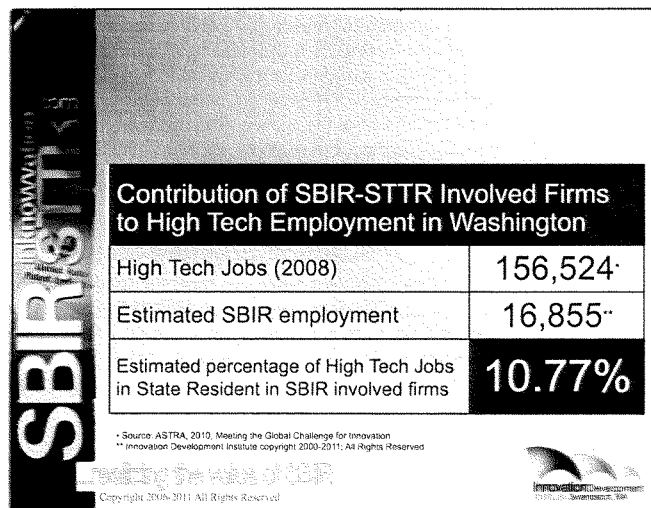
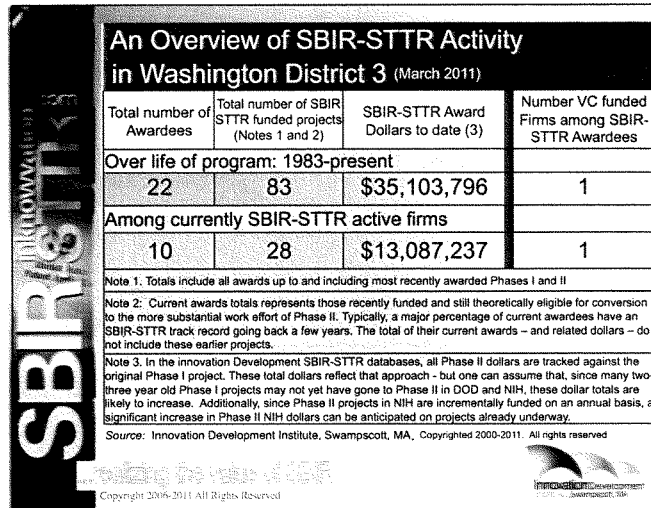












APPENDIX G

Observations on the Small Business Innovation Research Program, Statement for the Record of Anu K. Mittal, Director Natural Resources and Environment Team, GAO-05-861T; June 28, 2005.

1. “Between July 1985 and June 1999, GAO reviewed, reported, and testified on the SBIR program many times at the request of the Congress. While GAO’s work focused on many different aspects of the program, it generally found that SBIR is achieving its goals to enhance the role of small businesses in federal R&D, stimulate commercialization of research results, and support the participation of small businesses owned by women and/or disadvantaged persons. Participating agencies and companies that GAO surveyed during the course of its reviews generally rated the program highly.” [Page 1]
2. “*High-quality research.* Throughout the life of the program, awards have been based on technical merit and are generally of good quality. For example, in 1989 we reported that according to agency officials, more than three-quarters of the research conducted with SBIR funding was as good as or better than other agency-funded research. Agency officials also rated the research as more likely than other research they oversaw to result in the invention and commercialization of new products. When we again looked at the quality of research proposals in 1995, we found that while it was too early to make a conclusive judgment about the long-term quality of the research, the quality of proposals remained good, according to agency officials.” [Page 5]
3. “*Widespread competition.* The SBIR program successfully attracts many qualified companies, has had a high level of competition, and consistently has had a high number of first-time participants. Specifically, we reported that the number of proposals that agencies received each year had been increasing. In addition, as we reported in 1998, agencies rarely received only a single proposal in response to a solicitation, indicating a sustained level of competition for the awards. We also found that the agencies deemed many more proposals worthy of awards than they were able to fund. For example, the Air Force deemed 1,174 proposals worthy of awards in fiscal year 1993 but funded only 470. Moreover, from fiscal years 1993 through 1997, one third of the companies that received awards were first-time participants. This suggests that the program attracts hundreds of new companies annually.” [Page 5]
4. “*Successful commercialization.* SBIR successfully fosters commercialization of research results. At various points in the life of the program we have reported that SBIR has been successful in increasing private sector commercialization of innovations. For example, past GAO and DOD surveys of companies that received SBIR Phase II funding have determined that approximately 35 percent of the projects resulted in the sales of products or services, and approximately 45 percent of the projects received additional developmental funding. We have also reported that agencies were using various techniques to foster commercialization. For example, in an attempt to get those companies with the greatest potential for commercial success to the marketplace sooner, DOD instituted a Fast Track Program, whereby companies that are able to attract outside commitments/capital for their research during phase I are given higher priority in receiving a phase II award.” [Pages 5 & 6]

5. *"Helping to serve mission needs.* SBIR has helped serve agencies' missions and R&D needs. Agencies differ in the emphasis they place on funding research to support their mission and to support more generalized research. Specifically, we found that DOD links its projects more closely to its mission. In comparison, other agencies emphasize research that will be commercialized by the private sector. Many of the projects DOD funded have specialized military applications while NIH projects have access to the biomedical market in the private sector. Moreover, we found that SBIR promotes research on the critical technologies identified in lists developed by DOD and/or the National Critical Technologies Panel." [Page 6]

APPENDIX H

An Assessment of the Small Business Innovation Research Program, National Research Council, National Academies Press; Charles W. Wessner, *Editor*, Committee on Capitalizing on Science, Technology, and Innovation; 2008; see: http://www.nap.edu/catalog.php?record_id=11989

NATIONAL RESEARCH COUNCIL (NRC) STUDY FINDINGS:

1. **“The Small Business Innovation Research (SBIR) Program Is Making Significant Progress in Achieving the Congressional Goals for the Program.** The SBIR program is sound in concept and effective in practice. With the programmatic changes recommended here, the SBIR program should be even more effective in achieving its legislative goals.
2. **Overall, the Program Has Made Significant Progress in Achieving its Congressional Objectives by: Stimulating Technical Innovation.** By a variety of metrics, the program is contributing to the nation’s stock of new scientific and technical knowledge.
3. **Using Small Businesses to Meet Federal Research and Development Needs.** SBIR program objectives are aligned with, and contribute significantly to fulfilling the mission of each studied agency. In some cases, closer alignment and greater integration should be possible.
4. **Increasing Private Sector Commercialization of Innovation Derived from Federal Research and Development.** The program enables small businesses to contribute to the commercialization of the nation’s R&D investments, both through private commercial sales, as well as through government acquisition, thereby enhancing American health, welfare, and security through the introduction of new products and processes.
5. **SBIR Is Meeting Federal R&D Needs.** SBIR plays an important role in introducing innovative, science-based solutions that address the diverse mission needs of the federal agencies.
6. **SBIR Projects Attract Significant Additional Funding.** SBIR funded research projects enable small businesses to develop the technical know-how needed to attract third-party interest from a variety of public and private sources, including other federal R&D funds, angel investors, and venture funds. The NRC survey revealed that 56 percent of surveyed projects were successful in attracting additional funding from a variety of sources.
7. **Linking Universities to the Public and Private Markets.** The SBIR program supports the transfer of research into the marketplace, as well as the general expansion of scientific and technical knowledge, through a wide variety of mechanisms. With regard to SBIR’s role in linking universities to the market, about a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself in

developed technologies. This involvement took a number of forms.⁴¹ Among the responding companies—

- a. More than two-thirds had at least one academic founder, and more than a quarter had more than one;
- b. About one-third of founders were most recently employed in an academic environment before founding the new company;
- c. In some 27 percent of projects, university faculty were involved as principal investigators or consultants on the project;
- d. 17 percent of Phase II projects involved universities as subcontractors; and
- e. 15 percent of Phase II projects employed graduate students.

These data underscore the significant level of involvement by universities in the program and highlight the program's contribution to the transition of university research to the marketplace."

APPENDIX I



ACQUISITION AND
TECHNOLOGY

DEPUTY UNDER SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

DEC - 8 2008

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Small Business Innovation Research (SBIR) Program Phase III Guidance

ACQUISITION AND
TECHNOLOGYDEPUTY UNDER SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

DEC - 8 2008

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Small Business Innovation Research (SBIR) Program Phase III Guidance

A primary purpose of Small Business Innovation Research (SBIR) Program is to stimulate technological innovation by increasing small business participation in federally funded Research and Development (R&D). The Department of Defense (DoD) SBIR Program is executed by the DoD Components. The Program is funded via 2.5% set-aside of the extramural Research Development Test and Evaluation (RDT&E) budget in excess of \$100 million and is implemented through a uniform, three-phase competitive process. Proposals are submitted in response to DoD solicitations and funding agreements (contracts) are awarded to qualifying small businesses for R&D to meet stated Department needs. The SBIR Program invests over \$1.1 billion annually to develop needed technologies through selection and award of roughly 2,000 Phase I feasibility studies and over 1,000 Phase II development efforts per year across the Department.

SBIR Phase III is both a principal objective of the SBIR Program and a means through which the Department realizes value from SBIR. SBIR Phase III refers to work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements. Phase III work is typically oriented towards commercialization of SBIR research or technology to bring it to the marketplace, and must be funded by non-SBIR sources. There are several characteristics and requirements associated with SBIR Phase III detailed in the Small Business Administration's Policy Directive that must be understood by all DoD component contracting and acquisition activities.

1. SBIR technical data rights extend to Phase III. A Phase III award is, by its nature, an SBIR award, has SBIR status, and must be accorded SBIR data rights. If an SBIR awardee wins a competition, or receives a sole-source award or a subcontract, for work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements, then the funding agreement for the new award must have SBIR Phase III status.

2. Phase III contracts or subcontracts may be awarded without further competition. The competition for SBIR Phase I and Phase II awards satisfies statutory competition requirements. Therefore, an agency that wishes to fund an SBIR Phase III project is not required to conduct another competition, or process a Justification and Approval (J&A) pursuant to FAR 6.302-5, in order to satisfy those statutory provisions, and may do so directly from Phase I or Phase II. If an



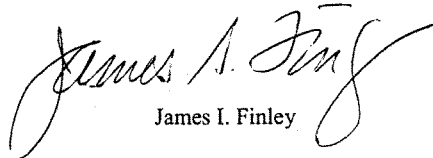
agency requires processing of a J&A in conducting actions relative to a Phase III SBIR award, it is sufficient to state, for purposes of the justification, that the project is an SBIR Phase III award that is derived from, extends, or logically concludes efforts performed under prior SBIR funding agreements and is authorized under 10 U.S.C. 2304(b) (2). In addition, the small business size standard, once met at the time of Phase I or II award, does not apply to Phase III.

3. The Department must show preference for SBIR-funded technology in Phase III. For Phase III, Congress intends that agencies or Government prime contractors that pursue R&D or production for agencies utilizing technology developed under the SBIR Program, give preference, including sole-source awards, to the awardee that developed the technology. Further, the Small Business Act requires that agencies report to the SBA all instances in which R&D or production of a technology developed by an SBIR awardee is pursued with a concern other than the one that developed the SBIR technology.

To properly implement this responsibility, DoD R&D and acquisition offices should be aware (and major systems prime contractors should be made aware) of relevant technologies being developed through SBIR, and through all other DoD programs and activities. Consistent with DoD policy, program managers should include SBIR as part of ongoing program planning and give favorable consideration, in technology and acquisition planning processes, for funding successful SBIR technologies. ACAT 1 programs should address plans for funding and insertion of SBIR-funded technologies at milestone reviews.

4. SBIR Phase III contract actions must be reported. Work performed under a DoD prime contract that principally derives from, extends, or logically concludes work begun under a prior SBIR effort should be coded as SBIR Phase III in the Federal Procurement Data System-Next Generation (FPDS-NG). At the present time, FPDS-NG only allows identification of Phase III awards to Small Businesses. A change request was submitted on January 18, 2008 to allow it to identify Phase III awards to other than small businesses.

As a vehicle to tap thousands of high-technology small businesses for solutions, the SBIR Program is an exceptional source of innovation and industrial base vitality. As such, it is imperative that SBIR Phase III efforts be executed in a manner consistent with the tenets listed above. DoD SBIR policy discussed in this memorandum will be reflected, as appropriate, in DoD regulations. I appreciate your support and assistance.

A handwritten signature in black ink, reading "James I. Finley". The signature is fluid and cursive, with a large, sweeping "J" and "F".

James I. Finley

APPENDIX J

Managing University Intellectual Property in the Public Interest

*Committee on Management of University Intellectual Property:
Lessons from a Generation of Experience, Research, and Dialogue*

Board on Science, Technology, and Economic Policy

Committee on Science, Technology, and Law

Policy and Global Affairs

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NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

PRINCIPAL FINDINGS AND RECOMMENDATIONS

The University and the Transfer of Technology

Finding 1: The first goal of university technology transfer involving IP is the expeditious and wide dissemination of university-generated technology for the public good. The public good might include inputs into further research, new products and processes addressing societal needs, and generation of employment opportunities for the production, distribution, and use of new products. Although the transfer methods will vary from institution to institution depending on the history, location, and composition of their research portfolio, the goal of expeditious and wide dissemination of discoveries and inventions places IP-based technology transfer squarely within the research university's core missions of discovery, learning, and the promotion of social wellbeing.

Finding 2: The transition of knowledge into practice takes place through a variety of mechanisms, including but not limited to:

1. movement of highly skilled students (with technical and business skills) from training to private and public employment;
2. publication of research results in the open academic literature that is read by scientists, engineers, and researchers in all sectors;
3. personal interaction between creators and users of new knowledge (e.g., through professional meetings, conferences, seminars, industrial liaison programs, and other venues);
4. firm-sponsored (contract) research projects involving firm-institution agreements;
5. multi-firm arrangements such as university-industry cooperative research centers;
6. personal individual faculty and student consulting arrangements with individual private firms;
7. entrepreneurial activity of faculty and students occurring outside of the university without involving university-owned IP; and
8. licensing of IP to established firms or to new start-up companies.

All eight mechanisms, often operating in a complementary fashion, offer significant contributions to the economy. The licensing of IP, although not the most important of these mechanisms, is most often discussed, measured, quantified, and debated than all other mechanisms combined, and is the subject of our findings and recommendations.

APPENDIX K

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How Expanding the STTR Program Can Instantly Create Jobs and Technology Clusters

By memorandum or Executive Order, President Obama can dramatically create more jobs and encourage technology clusters by simply increasing the STTR (Small Business Technology Transfer program) program from the current 0.3 percent of the federal extramural R&D budget to 2.5 percent. This will not impact the budget deficit now or in the future.

This expansion will force the most innovative sector of the U.S. economy, small businesses, to cooperate more closely with the best basic research institutions in the world, American universities. The STTR is a very successful federal R&D procurement program specifically created by Congress in the *Small Business Research and Development Enhancement Act of 1992 (P.L. 102-564, S. 2941, Oct. 28, 1992)* to build bridges between universities who perform advanced research and small businesses who bring innovative products to market.

The commercialization success of the STTR program has been significant – with commercial sales dollars by the successful companies that are considerably greater than the initial federal funding. The 2001 GAO report,¹ which looked at the early results of the program, showed that for the 101 companies responding to their survey, 51 had successful Phase III projects, with sales totals of \$132 million – compared to the cumulative federal investment in these STTR companies of approximately \$44 million – a 3:1 return on taxpayer funds.

Technology clusters (with cooperating research universities and innovative businesses) have been demonstrated to create explosive centers of job growth, innovation and venture capital support – such as Silicon Valley, Boston's Route 128, San Diego's communications and biotech communities, Research Triangle Park in North Carolina, and Ann Arbor/WARF, MI. Numerous studies (from David Birch in 1980s through Office of Advocacy, 2008) have demonstrated the job creation and economic multiplier effect of these collaborations between research universities and technology companies with their development, commercialization and marketing skills.

The funds for the expansion of the STTR program will come from already budgeted federal extramural R&D funds – and at least 30% of the STTR funds *MUST* be spent with universities or similar research organizations. Since much of the extramural funds go to large companies, this will be a net increase for universities. Further, the STTR program has already developed model agreements for the management of the small company/

¹ GAO-01-867T, FEDERAL RESEARCH AND DEVELOPMENT, *Contributions to and Results of the Small Business Technology Transfer Program*, Testimony before the Senate Small Business and Entrepreneurship Committee, June 21, 2001

university intellectual property rights so these programs are “shovel ready” and meet the important research needs of the federal agencies. (See:

<http://grants1.nih.gov/grants/funding/sbirsttr1/STTRModelAgreement.doc>)

The most significant new innovations in the marketplace have been demonstrated to come from small businesses – especially from STTR and SBIR firms. An important new study, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006*² reports:

“The results show that these SBIR-nurtured firms consistently account for a quarter of all U.S. R&D 100 Award winners—a powerful indication that the SBIR program has become a key force in the innovation economy of the United States.”

[Note: the SBIR and STTR budgets combined are only 2.8 percent of the federal extramural budget – the rest goes mostly to large businesses and then to universities.]

² THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, July 2008, Washington, DC. See:

<http://www.itif.org/publications/where-do-innovations-come-transformations-us-national-innovation-system-1970-2006>

APPENDIX L

Few Businesses Sprout, With Even Fewer Jobs

Wall Street Journal
NOVEMBER 18, 2010

By **JUSTIN LAHART** And **MARK WHITEHOUSE**

Fewer new businesses are getting off the ground in the U.S., available data suggest, a development that could cloud the prospects for job growth and innovation.

[View Full Image](#)



Dan Krauss for The Wall Street Journal

A circuit board by Tesla Controls, one of many new companies with no workers beyond its founder.

In the early months of the economic recovery, start-ups of job-creating companies have failed to keep pace with closings, and even those concerns that do get launched are hiring less than in the past. The number of companies with at least one employee fell by 100,000, or 2%, in the year that ended March 31, the Labor Department reported Thursday.

That was the second worst performance in 18 years, the worst being the 3.4% drop in the previous year.

Newly opened companies created a seasonally adjusted total of 2.6 million jobs in the three quarters ended in March, 15% less than in the first three quarters of the last recovery, when investors and entrepreneurs were still digging their way out of the Internet bust.

Research shows that new businesses are the most important source of jobs and a key driver of the innovation and productivity gains that raise long-term living standards.

Without them there would be no net job growth at all, say economists John Haltiwanger of the University of Maryland and Ron Jarmin and Javier Miranda of the Census Bureau.

"Historically, it's the young, small businesses that take off that add lots of jobs," says Mr. Haltiwanger. "That process isn't working very well now."

Ensnconced in a strip mall behind a Carpeteria outlet, Derek Smith has been tinkering for two years with a wireless electrical system that he says can help schools and office buildings slash lighting bills. With his financing limited to what he earns as a wireless-technology consultant, he has yet to hire his first employee.

This is a far cry from his last start-up, which he cofounded in 2002. At the two-year mark, that company, which makes radio-tracking gear for hospital equipment, had five employees, about \$1 million in funding from angel investors and offices with views of downtown San Diego.

"When I started this the plan was to go out and raise a bunch of money," says Mr. Smith, who is 36 years old. That was in late 2008, just as financial markets around the world collapsed. "I quickly discovered I can't do what I did before."

Tough economic times have pushed more Americans into business for themselves, working as consultants or selling wares online. But many are not taking the additional step of forming a company and hiring employees.

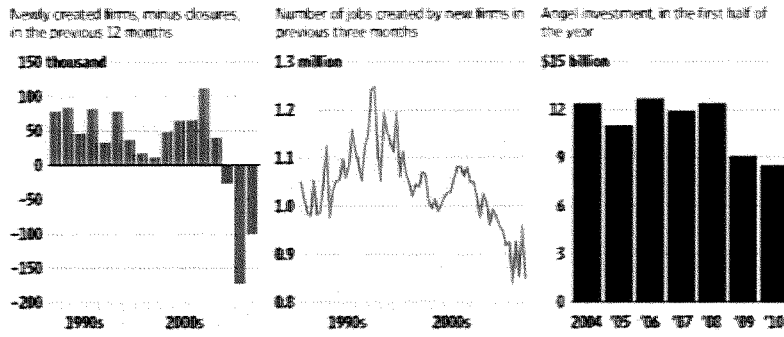
For people like Mr. Smith, lack of funding seems to be the biggest problem. Two traditional sources of start-up cash—home-equity loans and credit cards—have largely dried up as banks wrangle with massive defaults and a moribund housing market. Venture-capital firms that typically invest in young companies, as well as angel investors that focus on early-stage start-ups, are pulling back as they struggle to sell the companies they already own.

Venture-capital firms invested \$25.1 billion in the year that ended in September, up 10% from the same period a year earlier but still down 27% from two years earlier, according to Dow Jones VentureSource. Angel investment amounted to \$8.5 billion in the 2010 first half—30% below the average level in the five years leading up to the financial crisis, estimates Jeffrey Sohl, director of the Center for Venture Research at the University of New Hampshire.

"I've never seen seed capital so low," says Mr. Sohl. "This is alarming."

No Start-Ups, No Jobs, No Money

Start-ups, struggling amid a dearth of financing, aren't making their traditionally large contribution to job growth.



Some entrepreneurs say it's not all about financing, though. They express concern about taxes, health-care costs and the impact that wrangling in Washington over the federal budget deficit will have on them. "I can't determine what the cost of providing health care for employees would be," says Kevin Berman, 47, who is starting a local-produce company in Orion Township, Mich., called Harvest Michigan. Starting a company "is harder than it was at any time I can remember."

San Diego has long been one of the nation's entrepreneurial hotbeds, a culture that dates back to the 1960s with the founding of Linkabit Corp., a communications company whose alumni have launched scores of technology companies. A 1970s biotechnology start-up, Hybritech Inc., gave rise to a thriving biotechnology industry.

Lately, though, the pace of start-ups securing funding in San Diego has been slowed at the University of California at San Diego center that helps researchers move their work into the commercial sphere. "Investors are moving away from early-stage companies," says Rosibel Ochoa, director of the William J. von Liebig Center. "Nobody wants to touch them."

Scarce funding is putting researchers like Deli Wang in a bind. The 42-year-old engineering professor is an expert on nanowires, thread-like structures with widths less than a thousandth the diameter of an average human hair. He has a plan to make light-emitting diodes using nanowires that, he says, would be far more efficient than existing alternatives. Investors, he says, are interested—if they can see a prototype. Building one would cost Mr. Wang \$200,000 that he doesn't have. "We're kind of stuck," he says.

To be sure, some companies are still getting started, particularly in biotechnology, where cash-rich pharmaceutical concerns are eager buyers and investors. In the first half of 2010, health care and biotech accounted for 44% of all angel investments, Mr. Sohl says.

Derek Smith, owner of Tesla Controls, handles his own bookkeeping, emails and circuit-board fabrication.

And in many cases, entrepreneurs today don't need as much money, or as many people, to start new businesses. Software, communications technology and high-tech equipment are far cheaper and far more powerful than they were a decade ago.

At Mr. Smith's one-man San Diego start-up, Tesla Controls Corp., circuit boards, semiconductor chips and other components litter a plastic folding table he uses as a workbench. "The hardware stuff is all cheaper," he says. "Any of these chips are \$5 or less."

Much of Mr. Smith's economizing is the result of necessity. With a family to support, he doesn't want to borrow against his house. Angel investors, if interested, would demand a larger stake at a lower price than he can stomach. And the small stake he still has in his earlier start-up, Awarepoint Corp., is only paper wealth.

The lack of funding is slowing him down. And the day a week he spends on consulting takes away from the time that he can devote to his new company. "I would love to be able to hire other people," he says. "But right now I can't."

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http://online.wsj.com/article/SB100014240527487046486045756210618922216250.html?mod=WSJ_hp_LEFTWhatsNewsCollection

APPENDIX M

Roland Tibbetts White Paper

May 28, 2008

REAUTHORIZING SBIR: THE CRITICAL IMPORTANCE OF SBIR AND SMALL HIGH TECH
FIRMS IN STIMULATING AND STRENGTHENING THE U.S. ECONOMY

Roland Tibbetts
SBIR Program Manager, 1976 - 1996
National Science Foundation

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The proposed Small Business Innovation Research (SBIR) reauthorizing legislation (H.R. 5819) is of great concern to thousands of small technology-based firms and should be of similar concern to Congress.

The bill would significantly weaken the basic elements of the SBIR program by

- (1) Cutting the number of awards, probably in half. Far larger SBIR awards would be allowed. Companies could receive multiple development awards. Agencies could waive even the higher award caps. Yet the overall size of the program would not be increased. Together, these steps would eliminate funding for a large number of innovative and breakthrough ideas.
- (2) Allowing firms to avoid SBIR's competitive "proof of concept" step and move directly to much larger "development" awards. This is an irresponsible policy for a program that is funding very high-risk ideas. The "proof of concept" requirement, Phase I of SBIR, is necessary to weed out ideas that are not feasible, so that large sums of taxpayer dollars aren't wasted on them.
- (3) Substituting SBIR's R&D funding for private investment capital in the commercialization phase of SBIR (Phase III). Phase III is a market-based reality check. A project that can't attract private-sector funding or mainstream government procurement contracts at that point should not be pushed forward with more R&D funding from SBIR.
- (4) Threatening the integrity of SBIR as a small business program by weakening the safeguards against large business access to SBIR funds.

With each of these changes, the needs of the SBIR Program, and the history of its best practices, call for doing exactly the opposite of what the bill proposes.

What SBIR Is Designed to Do

SBIR was created to address a need that is still critical: to provide funding for some of the best early-stage innovation ideas – ideas that, however promising, are still too high risk for private investors, including venture capital firms. As happened with Microsoft, Apple and hundreds of other firms, technology innovations can mushroom into major products and businesses once private sector investors make a commitment. But they'll only make that commitment once the innovation is well along. In 2005 only 18 percent of all US *venture* capital invested went to seed and early stage firms while 82 percent went to later stages of development that are lower risk.

The positive role of innovative small technology firms in the economy is evident not only in the dozen or so geographic strongholds of tech entrepreneurship across the nation, but also in the increased productivity of the companies that buy and use the innovations. That is perhaps the most compelling reason to maintain a strong, effective SBIR Program.

SBIR addresses a paradox at the heart of innovation funding: capital is always short until the test results are in. At the idea stage, and even the early development stage, the risks are too great for all but a few investors. But innovations can't get beyond that stage without funding.

There is another paradox, too. The federal government has R&D needs that, for a variety of reasons, will never interest private sector investors. The business models of most investors focus on generating many sales to many customers. When the government is the only buyer, and buys on a one-time or very occasional basis, investors get skittish.

Large government contractors typically aren't interested in such R&D, either. The amounts involved are too small, and most large contractors don't have early-stage R&D capabilities anyway.

So needed innovations in fields like defense, space exploration and homeland security may not occur. The same can be true for innovations in science, especially the health sciences, when the projected patient populations are small or the innovation may only be needed once per person (such as with a vaccine).

SBIR was designed specifically to solve both of these paradoxes:

First, it provides a transparent, competitive and reliable source of early-stage funding for R&D, based entirely on scientific merit. Today, SBIR is the nation's largest source of such funding.

Second, it allows the government itself to obtain needed R&D that the private sector could not otherwise provide.

Why SBIR Has Been Successful

SBIR's success, as recently documented by the major National Research Council / National Academy of Sciences study, is rooted in a number of the program's characteristics.

Drawing on small business scientific talent. SBIR draws on the six million scientists and engineers that are now employed by small firms. That compares to the five million employed by medium-sized and large firms. In fact, small business employs more scientists and engineers than large business, universities, federal labs, or nonprofit organizations. A great many of these small business scientists and engineers are entrepreneurial. To see the entrepreneurial zeal of these technology-based small companies, one has only to look at the extent to which the SBIR Program and the nation's venture capital companies – the only important sources of risk capital for such companies -- are swamped with proposals. Or one can look at patents granted. The SBIR Program accounts for more than 50,000 of them. Currently, it accounts for an average of seven patents a day, which is more than all U.S. universities combined. SBIR has given us Qualcomm, Symantec and dozens of other highly successful technology companies.

Providing the primary source of government R&D funding for small business. Despite their huge numbers of scientists and engineers, and despite their well-documented science and technology successes, small businesses have virtually no access to federal R&D contracts outside of the SBIR Program. According to the National Science Foundation's annual *Science Indicators* report, large firms receive 50.3 percent of federal R&D, universities receive 35.3 percent, non-profits 10 percent, and small businesses just 4.3 percent. SBIR accounts for over half of that 4.3 percent. This is an astonishingly small figure for a nation that expects technological innovation to lead it to new economic heights, but there it is. For small companies, SBIR remains the only game in town, just as it was in 1983, when it began.

Adopting best practices.

In designing the SBIR program, I drew on my own experience as a founder, director and treasurer of Allied Capital here in Washington and as operational VP for two small tech firms, one of which grew to 600 employees before being sold to TRW. I read about 50 articles on innovation and R&D management. I talked with a few dozen economists and directors of research in large firms and universities. I met with ten or so venture capitalists. I asked them, and others like the DuPont R&D advisory committee, about best practices.

Best practices 1: managing portfolio risk. One thing everyone agreed on was the need to manage R&D portfolio risk through diversification. With the high risk involved in early-stage R&D, there is need to diversify the federal investment by betting on many, rather than fewer, technologies and ideas. (The R&D risk is high not only because of the technical challenges but also because cutting-edge R&D requires expensive equipment. Such R&D is the furthest away in time from the market, and the market may change during that period.)

The size of SBIR awards and thus the dollars at risk per innovation was therefore a major topic. Most of those I worked with in developing SBIR agreed that the technologies involved were such inherently high risks that smaller bets should be made on many projects before making a few larger bets.

Best practices 2: making the largest number of awards possible. Making many smaller awards was not only good risk management practice. Virtually everyone I spoke with argued, and my own 20-year experience as an SBIR Program Manager subsequently confirmed, that the economic payoffs would be higher this way. Many smaller awards mean that more ideas can be evaluated for their potential. More and better choices for further development become available.

Probably a few thousand CEO's of small tech firms have talked with me about SBIR over the years. In general, they liked almost everything about SBIR, except the terrible odds against winning an award. Many no longer submit proposals because of the large investment of time and cost required to prepare a competitive proposal when only one in 15-20 receive the larger Phase II funding. Others still compete because there are almost no alternative sources of such funding.

If there are fewer SBIR awards in the future, not only will fewer technologies get evaluated and funded. Fewer companies will compete, because the odds against winning will get even higher. I believe we have been seeing some of this occur already at the National Institutes of Health, where larger award sizes and fewer awards have been accompanied by a fall off in applicants.

Best practices 3: creating scientific gates and milestones. Another best practice that we adopted for SBIR was the use of science-based gates and milestones before letting projects obtain more funding. Often an idea can be found to be infeasible through the Phase I "proof of concept" process. Other ideas show only a low probability of success. No further expenditures should be made on such technologies.

Unfortunately, some companies always came to us seeking to obtain as much SBIR funding as possible in both Phases I and II. Indeed, during my 20 years as an SBIR program manager, we frequently heard such requests from both the companies and the agency scientists and engineers. However, no proposer was ever allowed to go directly to Phase II. Even if they had done relevant work earlier, we expected Phase I to show further progress. Our strict policy on this point proved to be a good thing. The companies that argued that they had already done the early R&D, and therefore should be able to go directly into Phase II, almost always were unsuccessful when faced with competition. Their requests had been sales ploys. A company's success on earlier projects was no guarantee that its newest idea was competitive.

It is important to always remember that SBIR provides funding for *ideas*, not for *companies*. Competitive, science-based gateways are vital for identifying the best ideas.

Best practices 4: making SBIR a powerful economic development tool.

The past. The roots of SBIR actually go back to Congress' concern over the "Rust-Belt Recession" of the 1970's. Unemployment in Detroit was high, due to the growing sales of new smaller automobiles and machine tools from Japan and Germany. The question was asked whether National Science Foundation research was focused on economic needs. The result was a new NSF program in applied research called "Research Applied to National Needs" or RANN. For the first time in NSF history, ten percent of a program budget – the RANN program budget -- was set aside for small business. This was the basis for the design and initiation of the Small Business Innovation Program at NSF in 1977. That program grew each year. Its successes led to legislation in 1982 that required all agencies with an extramural R&D budget over \$100 million (today 11 such agencies) to participate. There were some early successes, such as Symantec, that gave us confidence in the basic design of the program.

A little background here: Individuals and small firms are the primary source of category-creating inventions and technical breakthroughs. It is not the successful wagon company that invents the automobile. And it's not the large business that risks upending its business model and its product lines. Small company major economic breakthroughs include the digital computer, microchips, the personal computer, software, the successful cell phone, the internal combustion engine, diesel engine, steam turbines (steamships and railroads), the electric motor, typewriter, telephone, refrigerator, electric transmission, phonograph, incandescent lights, vulcanized rubber, pneumatic tire, photo plate, airplane, motion picture, anesthesia, x-ray MRI; and even earlier the cotton gin, power looms, the sewing machine, the mechanical reaper, and other agricultural machines.

Fast forward a few generations: The great technology-based economic successes of the late 1970's and 1980's – along the Route 128 corridor near Boston and in Silicon Valley – as well as the communications and information technology companies that have proliferated since the 1990's, were the result of tens of thousands of scientists and engineers annually opting to start or join small firms. Often this included many of the best and brightest, the most creative, the most entrepreneurial, and the shrewdest risk takers: exactly the qualities that private sector investors, particularly venture capital companies, were looking for.

Think about what happened as Internet-based businesses grew in the 90's. It wasn't all boom and bust. The core of the "dotcom" era was a series of rapid and related breakthroughs in new and emerging technologies. Most of the breakthroughs came from startup companies. Five "dotcom" era startups are now in the "20 Most Widely Held Stocks in the U.S": Intel (microchips), Microsoft (software), Apple (personal computers), Oracle (relational databases) and Cisco Systems (networks). In 2007 alone, their combined sales were \$166 billion and they employed 221,000. Add to this the thousands of smaller new firms with directly related new products and services, both in the U.S. and worldwide. Overall, the "dotcom" era was probably the largest economic growth breakthrough in history.

The future. Just as we have seen small-business-driven technological breakthroughs throughout our history, we can see them again in the future. There are a whole series of new and emerging technology areas where innovations could have powerful economic impacts. They include:

- global warming and other environmental areas, such as water purity;
- alternative energy and energy conservation;
- all kinds of security -- national, military, commercial, and economic;
- ever-changing communications;
- health care improvements and cost reduction measure;
- disease prevention;

- more effective education;
- improved transportation;
- agricultural challenges addressed;
- nano- and miniaturization technology;
- automated manufacturing; and many more.

All of these needs represent potentially large markets. Today, the technological risks are still too great for most private investors. But the technologies still need funding. SBIR is perfectly situated to explore ideas in these areas.

SBIR funding is necessary because large firms, despite their public relations, do not in fact invest extensively in these areas. Big companies do not take major risks on unproven technologies, except with massive government funding, such as in defense, NASA, and nuclear power. Large firm R&D budgets focus on improving product competitiveness and the processes for fabricating their goods, solving specific problems, and overall growth in sales and profits. Universities and non-profits also cannot raise high risk money for private sector technological innovations.

The mechanism. Generally only small high-tech firms can raise sufficient amounts of high risk capital to pursue commercially and economically relevant innovations. The key reason for this is that only small companies can realistically offer the promise of their stocks multiplying dozens of times. It's the prospect of that exponential growth in stock value which makes the rewards worth the risks to investors.

When SBIR is guided well, it fosters breakthroughs by such small companies. These breakthroughs get the technologies to the point where they can deliver great economic benefits.

At that point, when the scientific evidence is starting to come in, innovations attract not only additional VC investments, but also investments by individual "angels," mutual funds, insurance companies, endowment funds, and others. Longer-term bank lending becomes possible. All of that financing lays the foundation for stock offerings. Then these stock offerings attract more capital. This business growth, plus the revenues from subsequent product sales and spin-offs, is the money that stimulates the economy.

Successful SBIR-funded technologies can thus generate many multiples of their federal investments, often in a much shorter time frame than traditional investments.

Again, the key steps are: casting the net as widely as possible, attracting entrepreneurial individuals and small companies, insisting on technical feasibility in a competitive and transparent environment, and then moving to a commercialization phase that requires private sector investment equaling or exceeding the federal investment.

What To Avoid in the Future

Avoid needless disruptions to the SBIR Program.

SBIR has proven itself over 25 years. It is known and understood by hundreds of thousands of scientists and engineers, most of them in small firms, but many of them also in the 11 participating federal R&D agencies, in universities, in venture capital companies, in larger firms, in Congress and in other parts of government, including the 50 state governments and a number of foreign countries. SBIR is successful. The National Research Council / National Academy of Sciences comprehensive assessment of the SBIR program last year confirmed the effectiveness of SBIR along the broad general lines that it exists today. Other studies, too, such as those by GAO and by Professor Josh Lerner of Harvard Business School have been highly favorable. No reputable independent study in the past 25 years has called for major changes in SBIR.

Rather than implementing the constructive recommendations offered by the NRC/NAS study, the House-passed bill (H.R. 5819) mandates a vast upheaval in SBIR. Such a re-write of the program would make the NRC/NAS changes far more difficult to execute. How, for example, can the agency Advisory Committees that the study recommends do their work when agencies in the program would be spending the next few years redrafting all their SBIR program rules and retraining all their personnel?

Worse, the extensive reworking of the program would confuse everyone who uses the program – all those people in the small firms, universities, VC firms, large companies, state programs, and Congress that tap into the program. It would lead to lengthy award delays as the program is retooled in one agency after another.

Small technology-based companies will suspect, probably correctly, that all these changes will self-destruct and that SBIR will have to be re-tooled again in a few more years. So they'll hold back and shift to other activities. This will intensify the upheaval.

And for what? H.R. 5819 is designed to sharply increase the amount of SBIR funding that goes to maybe half the current number of companies, and to explore perhaps half as many promising ideas. This bill is more like special interest legislation than national interest legislation.

All available evidence suggests the major changes proposed by H.R. 5819 would be highly detrimental to SBIR's mission and effectiveness. Congress has never examined the full implications of these changes and should not embark on them without doing so. Unraveling SBIR now, at a time when the nation urgently needs the economic boost that the program can provide, would be a national tragedy.

Avoid excessive increases in award sizes.

SBIR is not intended to pay for the entire R&D costs required for every project. Some ideas could require tens of millions and even hundreds of millions of dollars ultimately. The purpose of SBIR, as stated earlier, is to lower the R&D risk to the levels that can attract private investment.

H.R. 5819 triples the Phase II award cap, making it \$2.2 million. The bill would also allow agencies to make multiple Phase II awards, and even to waive the \$2.2 million cap. One effect of doing all this will be to divert tremendous amounts of energy to negotiations about how much of an award each project will get. It is difficult, unwise and unfair to most small firms and program officers to have to judge how much to request or award over such a vast range of dollars. Determining the award size will become a time consuming negotiation, complicated by questions of fairness to other participants. Those other applicants often will be equally qualified, and their projects will always be in need of more money. Ultimately, the size of many awards will end up being decided by salesmanship and personal connections, not by science. This will be a very corrosive influence on SBIR.

Just as important, larger awards reduce the number of ideas that can be funded. An \$8 million Phase II award, if cut back to \$1 million, could free up funding for seven other \$1 million Phase II awards. Or, that \$7 million difference could fund 35 "proofs of concept" ideas at \$200,000 each. Similarly, a \$1 million Phase I "proof of concept" award eliminates the possibility of four others at \$200,000 each. We need to remember that research on innovative ideas at the idea stage is often primarily a one person job.

Avoid bypassing Phase I.

The foundation of the SBIR program is competition and openness. Take away the need to prove an innovation against other worthy innovations, in an above-board competition, and SBIR will degenerate into salesmanship and influence-peddling. Its genuine scientific accomplishments will diminish, year by year. If companies are allowed to apply directly for Phase II funding, SBIR will become little more than a traditional procurement program, not an innovation program. Phase I must not be by-passed; it is the seed bed of the entire SBIR Program.

Avoid using SBIR funds for commercialization.

If an SBIR firm cannot obtain a commercialization commitment from private sources, or from federal agencies (using non-SBIR funds), that at least equals the SBIR investment in an innovation, then SBIR's involvement in that innovation should end. The far more pressing public need is to fund additional recommended early-stage innovations, not to keep projects afloat that cannot attract financial support from the government or the private sector.

If SBIR award levels rise moderately to keep pace with inflation, an approach that the NAS/NAS study recommended, and that I agree with, then the SBIR investment in an early-stage technology idea should not exceed \$1.2 million (\$200,000 for Phase I and \$1 million for Phase II). An innovation that cannot match or exceed that \$1.2 million in the commercialization phase (Phase III) of SBIR, using non-SBIR funding, should not be rewarded with more SBIR funding.

In other words, no SBIR funds should be spent for Phase III. SBIR dollars are urgently needed to support additional promising ideas and to keep the high-risk SBIR portfolio diversified. If an agency feels that an innovation deserves financial support beyond a single Phase II award, then it can provide this further investment with non-SBIR funding. An agency that lacks that much faith in an innovation developed under its own guidance should not expect the taxpayers, via the SBIR program, to supply that faith.

Avoid steps that would diminish the small business character of the program.

Large companies view innovation much differently than small companies. A large company wants to protect its product lines and its customer bases. It looks for incremental innovations that make those existing products a little better and a little cheaper to produce. It looks for new products that are familiar and comfortable. For large companies, "re-defining" types of innovations are frightening. They upset settled ways of doing business. The nation needs both incremental innovations and quantum-leap innovations, but right now and for the foreseeable economic future, it needs those out-sized innovations the most. SBIR can deliver sweeping innovations, but to do so it must avoid taking on the coloration and biases of large companies.

Even if there were only a modest national need for "out-of-the-box" innovations, there would still be a powerful need for SBIR, because nothing else in the country, and certainly nothing else in the federal government, supports early-stage innovation by small companies. Despite having more scientists and engineers than large business, universities, nonprofit organizations, or the federal government itself, small business gets only 4.3 percent of federal R&D dollars. And SBIR accounts for over half of that. Those other institutions draw more than 90% of federal R&D dollars. And here's the rub: there aren't any other sources of that early-stage innovation funding for small business. Capital for small business innovation research is so short in the United States that SBIR rapidly became, and remains, the largest source of it.

I come from a long and deep background in venture capital and I am a great believer in it. SBIR won't be nearly as successful unless VC's can participate in it. But VC's that directly or indirectly report back to large companies shouldn't be in Phase I or Phase II of the SBIR program. Nor should VC's that are big companies themselves.

VC's that are large firms in fact or spirit will inevitably focus on companies more than innovations. That's fine in Phase III, but not earlier. If big VC's get into Phase I and Phase II, they will push for bigger bets on fewer companies. They will want to shift SBIR funding away from high-risk Phase I ideas and toward Phase II development, which is closer to market and therefore less risky for them. Sooner or later, they will back SBIR funding for Phase III, which will also offset some of their risk. And the kind of innovations they ultimately favor will be those that big companies favor – safer and more familiar ones, incremental rather than quantum leap. SBIR can do much more than this. SBIR's current restrictions on big VC's are therefore wise. By contrast, H.R. 5819's approach to this issue is dangerously unwise.

What to Do in the Future

We must meet the competitive challenge.

We are currently the world leader in small high tech firms, in venture capital, and in basic research. These strengths are critical to our future economic growth. But others are catching up.

China, Japan, and Western Europe are rapidly increasing their investment in all three areas.

In a recent Harvard Business School Bulletin article, Jim Breyer, founder of Accel Partners and past chairman of NVCA, stated that there are now 6,000 venture-backed companies in Beijing alone! Accel has recently closed its second Chinese venture fund for \$510 million. "Many of the very best [VC] firms in Europe and in Asia are affiliated with firms here in the United States," he notes.

The UK has just announced a new innovation program. Dozens of countries, notably including those that came here to study the SBIR program, are now increasing their investment in innovations by small technology firms, venture capital development, business schools, and basic research.

Seeking out technology breakthroughs should be a far more important objective of government R&D than ever before. The single most important initiative we could mount would be to increase the SBIR to 5 percent of extramural federal R&D in a series of steps.

Such an initiative would be opposed by the current recipients of over 90% of federal R&D, like large companies, universities, nonprofits, and the organizations representing them, but these were the same groups that opposed the creation of SBIR in the first place and have opposed every modest increase in the program ever since. The NAS/NAS report clearly shows that SBIR can successfully deploy additional funding.

Think what the Internet and the telecommunications revolution have done for our economy. This was accomplished primarily by small, high-tech firms with major VC support. Now the investment risk is even higher for initial funding. Seed-stage and early-stage VC support has plummeted. If there are only rare investments at the idea stage, there will be no storehouse of proven ideas ready for later development funding. As bad as our economic problems are today, with budget deficits, trade deficits, a shaky dollar, and so on, where would our tax revenues, our productivity, and our technology leadership be today if we had not had that technological revolution?

The SBIR program should be carefully strengthened.

The following are my recommendations to Congress about some specific issues in the SBIR reauthorization:

1. Small firms with 500 or fewer employees should remain eligible for SBIR awards as long as one or more large firms, including large venture capital firms, do not acquire a majority of ownership. Broad eligibility is necessary to identify and accelerate those innovations that can lead to technical and market success and superior economic growth. The nation needs these potentially fast-growing firms far more than those that do not grow. Outside investors can, and often must, obtain more than 50 percent of the stock to protect their investment. That should be acceptable in SBIR as long as these investors are individuals and as long as the companies that they represent are small, as is required today. However, these investors must not be controlled, directly or indirectly, by large businesses. SBIR was created to provide small companies with innovation funding. The program remains too small to allow funds to be siphoned off by large companies, which already receive over half of federal R&D.

2. There should be a set review period for Phase I results, as well as a set period for Phase II proposals, based upon Phase I results. Some firms are obtaining early reviews, before other firms. That is not fair to others and should not be allowed.

3. Agencies should not allow companies to extend the break between Phase I and II except for illness or similar reasons. On the other hand, agencies themselves sometimes need to extend the breaks between Phase I and Phase II due to budgetary issues. This should be allowed when truly necessary, despite justifiable company concerns about cash flow. In the end, SBIR's purpose is to fund ideas, not to support a company's financial picture.

4. SBA is still the proper organization to manage SBIR, not the Department of Commerce.

Criticism of SBA over the years has been due in great part to significant understaffing by SBA management that should not have been allowed. SBA's SBIR staff is less than half the level any evaluator would recommend. When SBIR was a much smaller program, SBA had eleven staff members assigned to it. Today, there are only four. This headquarters staffing crisis is responsible for many complaints. But some agencies, such as DOE, also grossly under-staff SBIR. This leads to reductions in the number of award topics, in order to reduce agency workloads, and to the temptation to use jumbo awards, far in excess of the program's legal guidelines. I suggest some kind of a brake on agency proposal cutbacks and stricter enforcement of the caps.

5. Breakthroughs occur in new and emerging areas that cannot be predicted. I suggest that all agencies should allow innovation proposals in all areas that are relevant to their R&D programs. This openness to innovation proposals should be outlined in agency solicitations. Many agencies think in terms of relatively few topic areas. The original interagency innovation program essentially opened entire agency R&D programs for proposals. Solicitations now have become far more restrictive, which cuts against the national economic interest. Breakthrough ideas that are relevant to an aspect of an agency's R&D should be invited.

6. The commercial results of SBIR need to be strengthened. Awards should not be made by agencies solely on the basis of technical merit and without any consideration being given to downstream commercial potential. Unfortunately, some SBIR firms favor agency approaches that minimize commercial potential, because the firms are really only interested in having their R&D ideas funded, not in commercializing the results. I suggest that proposers and agencies require a commercialization plan in both phases with a more detailed and specific plan in Phase II. Reviewers should consider both technical and commercial merit in their recommendations. This would include the proposer's plan for obtaining non-SBIR funding for Phase III. I would also support an SBIR funding cutoff for firms that win many Phase I awards without advancing any of

them to Phase II, along the lines of what H.R. 5819 proposes. SBIR was specifically designed to force the small firm to focus on innovation, technology breakthroughs, and commercialization for their economic benefits to the nation. Defense and NASA should also seek SBIR projects that have potential Phase III follow-on funding from non-SBIR sources. SBIR funds should not be used for mainstream procurement.

7. Award sizes should be increased in size in this reauthorization, to keep pace with inflation since the last adjustment in 1992. I recommend increasing Phase I awards to a \$200,000 cap and Phase II awards to a \$1 million cap. These are both substantial amounts of risk capital to explore technical feasibility. SBIR is not intended to build up the capabilities of a company, based on considerations like its other projects, but to explore the promise of the specific idea proposed. And SBIR's budget must fund as many ideas as possible.

8. The SBIR set-aside should be doubled as soon as possible. SBIR is a major national asset. It accelerates technological innovation and technology breakthroughs. It helps attract private sector investment to the most promising innovations. It increases economic growth. We need to reinvigorate the economy, and we need more technological innovation. Yet despite the history of small company innovations, notably relating to the Internet and to telecom, and despite the fact that there are six million scientists and engineers employed by small firms, over half of the government's external R&D, (50.3 percent) goes to large firms, 35.3 percent to universities, and 10 percent goes to non-profit institutions. Small business firms received only that 4.3 percent. (2005 figures from NSF.) Even a modest increase in the award caps, such as I recommend, will diminish the number of SBIR awards and companies unless Congress takes the sensible step that it took last time award steps were increased – increasing the program size by a large enough amount to offset the larger awards. Shrinking SBIR would be exactly the wrong thing for Congress to do at this point in our economic history.

Finally, I must say that as I review the SBIR recommendations made to Congress by the Biotechnology Industry Organization (BIO) and by my former VC colleagues in the National Venture Capital Association (NVCA), I am deeply troubled. It is mainly these two organizations that are calling for the far-reaching changes in the program. Many of the changes they are proposing would, in my judgment, significantly and perhaps irreparably harm the program. I can understand the desire of any organization to represent its members and prospective members, but this is a case when we must think of the broader national interest.

Without open and competitive early R&D efforts, spread as widely as possible, innovations will never reach the level of maturity that can draw in venture capital or other follow-on funding. BIO and especially NVCA should understand this. The need is to explore as many ideas as possible and lower the risk as much as possible to attract follow-on Phase III investment. There will be no shortage of great new innovations to invest in if we allow SBIR to do its work in supporting truly innovative small companies by objectively assessing which ideas are wheat and which ones chaff.

Congress supported the current SBIR objectives with the first SBIR legislation in 1982. The program is working well, but can be improved, as stated in the comprehensive NRC/NAS report. SBIR can stimulate thousands of high-risk, economically promising ideas like no other program. Given the opportunity to work as designed, and as proven, SBIR can make a major contribution to the national economic welfare.

May 28, 2008

APPENDIX N
MICHAEL SQUILLANTE CV



Curriculum Vitae

Michael R. Squillante, Ph.D.

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Chairman

Small Business Technology Council,
Washington, DC

Vice President of Research

Radiation Monitoring Devices, Inc.
44 Hunt St Watertown, MA

Research and Professional Experience

Dr. Michael Squillante received his Ph.D. in Chemistry from Tufts University in Medford, MA in 1980. In 1980 he joined Radiation Monitoring Devices, Inc. in Watertown, MA (RMD) as a Staff Scientist. He became Director of Research in 1983 and Vice President of Research in 1992.

Dr. Squillante oversees RMD's research and development activities in the Advanced Imaging Technology, Advanced Instrumentation, Sensor Development, Instrument R&D and Biosensor Technology departments, including research programs to develop instrumentation for cancer diagnosis, scientific research and industrial testing. He has been Principal Investigator and Program Manager on numerous programs funded by various government agencies including NASA, NIH, NSF, DOE, EPA, HSARPA, DND, and DOD to develop materials, sensors and instruments. He has been involved with the SBIR program since its inception and has successfully led projects through the research and development stage to successful commercialization.

Dr. Squillante has published over 100 technical papers. He is an editor on a book published by Materials Research Society (1998). He is co-author on chapters about materials science and detector technology in books published by Marcel Dekker (1993), Academic Press (1995), in the CRC Measurement and Sensors Handbook (1999), and the John Wiley Encyclopedia of Electrical and Electronic Engineering (1999).

Dr. Squillante is an adjunct Professor of Physics at the University of Massachusetts in Lowell.

Other Relevant Experience

Dr. Squillante is the Chairman of the Small Business Technology Council (SBTC) in Washington D.C., and a founding member of the New England Innovation Alliance, a group of 40 small high technology firms that meet monthly to discuss issues of importance to small companies.

Dr. Squillante served as a reviewer for the National Research Council of the National Academies of Science studies "An Assessment of the SBIR Program", 2008, "An Assessment of the SBIR Program at the National Institutes of Health", 2009, and "Venture Funding and the NIH SBIR Program" 2009.

Dr. Squillante testified at the Senate Small Business and Entrepreneurship Committee hearing on "Strengthening Participation of Small Business in Federal Contracting and Innovation Research Programs" in July 2006, and he participated in a Roundtable on "Reauthorization of the Small Business Innovation Research Program: National Academies' Findings and Recommendations" in August 2007.

In his home community of Waltham, MA, he served as an elected City Councillor from 1991 to 2003, and presently serves as an Associate Member of the Waltham Zoning Board of Appeals.

Appendix O

Analysis of SBIR vs. RO1 Win Rate

One of the frequent complaints from universities who participate in NIH grant funding is that it has become more difficult to obtain "RO1" grants over the last few years. While SBTRC believe university funding is very important, and must be supported, we would like to clarify statements made by others on the success rate¹ that can be misleading.

It is frequently cited that RO1 grants are only awarded at a 10-12% rate [one out of 8-10 proposals receive an award], while SBIRs are funded at a much higher rate, making it more difficult for universities to obtain funding. To clarify this, one should note first note that the RO1 success rate at the NIH for 2008 is 23.3% across all institutes [this means approximately one-fourth of proposals receive an award]. (Some institutes have 100% success rates on some types of grants, while others are below 10% and sometimes 0%).²

The second thing that should be noted is that RO1's average \$371,315 per year for as many as five years, or about \$1.85 million.

SBIRs at NIH in 2008 had a funding rate of 27.2% for Phase I's and 48.2% for Phase II's.³ While on the face, this looks to favor small business over the 23.3%⁴ success rates of RO1's for universities, we must recognize that Phase I awards are only for the first small feasibility phase and they are all subject to a down-select to receive a Phase II award, typically on about a 40% basis. The small business must first win the Phase I to be able to bid on the Phase II. [For 2008 this means that out of 2,712 Phase I proposals, only 283 went to Phase II awards; or approximately one-tenth of the proposals received a full Phase I and Phase II award after the down-select of the Phase I's.]

The Phase I SBIR award size at NIH for 2008 averaged \$173,833 (for one year), and the Phase II averaged \$565,549 for two years or about \$1.13 million.

For 2010, the SBIR program was even more competitive with 4,496 Phase I awards and 246 Phase II awards [or approximately one out of every 18 Phase I proposals went to Phase II – which equates to an NIH success rate of 5.4%] [See Appendix H Chart below.]

¹ Definition of Success Rate at the NIH: http://report.nih.gov/UploadDocs/NIH_Success_Rate_Definition.pdf

² http://report.nih.gov/award/success/Success_All_2007.xls

³ <http://report.nih.gov/UploadDocs/T215%20-%20SBIR%20Success%20by%20Phase%20-%20R1171.xls>

⁴ <http://www.niaid.nih.gov/ncnt/sbir/choices/1024x768/OnCue.html>; this can also be found at <http://www.niaid.nih.gov/ncnt/sbir/pres.htm> and clicking on "Choices and Historic Data" and then click on the fourth slide, Phase I and Phase II NIH Award Rates.

Year	Phase	RO1/ SBIR/ SBTR	# Applications	# Awards	Success Rate	Total Awarded	Average Award Size, \$	Usual Years	Average Expected Total Award= Avg. Award \$ x Usual # Years
2008 ^{3a}	RO1		26,059	6,075	23.3%	\$10,197,064,999*	371,315	5	1,856,575
2008 ^{3a}	Ph 1	SBIR	2716	739	27.2%	\$128,473,317	173,848	1	173,848
					48.2% x 27.2%=		560,047	2	1,120,094
2008 ⁴	Ph 2	SBIR	598	288	13.1%	\$161,293,806			



Table #215
NIH SMALL BUSINESS INNOVATION RESEARCH (SBIR)1
AND SMALL BUSINESS TECHNOLOGY TRANSFER (STTR)2 GRANTS
Applications, Awards, Success Rates and Total Funding by Phase
Fiscal Years* 2001 - 2010
Source: above, information extracted by SBTC

Source: Above NIH data and source, Competitive Rate calculated by
SBTC

**Excludes awards made with American Recovery and
Reinvestment Act (ARRA) funds.

select Autofilter to view totals or change display criteria.

Competitive
Rate =
1/Success
Rate: 3 =
3 proposals
for every
award

Effective
SBIR
Competitive
Rate*** =
Phase I
Applications
divided by
Phase II
Awards.

Fiscal Year	SBIR1/STTR2	Phase1	Number of Applications Reviewed	Number of Applications Awarded	Success Rate4	Total Funding5
2001	SBIR	Fast track	129	38	29.5%	\$5,980,388
2001	SBIR	Phase 1	2843	847	29.8%	\$106,846,359
2001	SBIR	Phase 2	656	344	52.4%	\$149,154,887
2001	STTR	Fast track	4	1	25.0%	\$221,244
2001	STTR	Phase 1	293	87	29.7%	\$11,050,737
2001	STTR	Phase 2	61	30	49.2%	\$8,450,786
2001	FY TOTAL		3986	1347	33.8%	\$281,704,401
2002	SBIR	Fast track	183	50	27.3%	\$9,457,671
2002	SBIR	Phase 1	3228	880	27.3%	\$114,965,906
2002	SBIR	Phase	684	335	49.0%	\$154,607,533

3.0 8.3

2002	STTR	Fast track	2	7	0	0.0%	\$0
2002	STTR	Phase 1		246	81	32.9%	\$11,091,888
2002	STTR	Phase 2		46	29	63.0%	\$9,213,048
2002	FY TOTAL			4394	1375	31.3%	\$299,336,046
2003	SBIR	Fast track		273	61	22.3%	\$9,355,517
2003	SBIR	Phase 1		4111	982	23.9%	\$141,724,444
2003	SBIR	Phase 2		751	327	43.5%	\$156,101,955
2003	STTR	Fast track		18	5	27.8%	\$1,437,438
2003	STTR	Phase 1		356	95	26.7%	\$13,121,162
2003	STTR	Phase 2		42	18	42.9%	\$5,910,606
2003	FY TOTAL			5551	1488	26.8%	\$327,651,122
2004	SBIR	Fast track		329	59	17.9%	\$9,470,090
2004	SBIR	Phase 1		4970	973	19.6%	\$151,945,326
2004	SBIR	Phase 2		810	302	37.3%	\$158,013,585
2004	STTR	Fast track		39	15	38.5%	\$2,737,587
2004	STTR	Phase 1		585	215	36.8%	\$32,923,178
2004	STTR	Phase 2		65	32	49.2%	\$14,688,924
2004	FY TOTAL			6798	1596	23.5%	\$369,778,690
2005	SBIR	Fast track		190	28	14.7%	\$4,566,024
2005	SBIR	Phase 1		4321	778	18.0%	\$121,650,043
2005	SBIR	Phase 2		869	312	35.9%	\$163,695,822
2005	STTR	Fast track		45	11	24.4%	\$1,650,033
2005	STTR	Phase 1		649	146	22.5%	\$22,771,532

3.2 9.6

3.7 12.6

4.3 16.5

2005	STTR	Phase 2	65	32	49.2%	\$14,956,978
2005	FY TOTAL		6119	1307	21.3%	\$309,290,432
2006	SBIR	Fast track	192	41	21.4%	\$6,794,013
2006	SBIR	Phase 1	3531	684	19.4%	\$112,491,826
2006	SBIR	Phase 2	857	355	41.4%	\$189,931,647
2006	STTR	Fast track	40	10	25.0%	\$1,238,312
2006	STTR	Phase 1	773	153	19.8%	\$27,612,469
2006	STTR	Phase 2	100	26	26.0%	\$13,492,117
2006	FY TOTAL		5493	1269	23.1%	\$351,560,384
2007	SBIR	Fast Track	226	40	17.7%	\$6,625,659
2007	SBIR	Phase 1	2721	656	24.1%	\$112,170,707
2007	SBIR	Phase 2	666	279	41.9%	\$147,335,075
2007	STTR	Fast Track	55	6	10.9%	\$1,074,719
2007	STTR	Phase 1	867	125	14.4%	\$22,214,361
2007	STTR	Phase 2	128	36	28.1%	\$15,126,058
2007	FY TOTAL		4663	1142	24.5%	\$304,546,579
2008	SBIR	Fast Track	210	66	31.4%	\$13,988,682
2008	SBIR	Phase 1	2,712	735	27.1%	\$127,767,276
2008	SBIR	Phase 2	593	283	47.7%	\$160,050,486
2008	STTR	Fast Track	42	4	9.5%	\$467,885
2008	STTR	Phase 1	681	108	15.9%	\$16,819,867
2008	STTR	Phase 2	118	46	39.0%	\$21,965,761
2008	FY TOTAL		4356	1242	28.5%	\$341,059,957
2009	SBIR	Fast Track	234	54	23.1%	\$15,730,380

4.7 13.8

4.3 9.9

4.1 9.8

3.5 9.6

2009	SBIR	Phase 1	2,963	650	21.9%	\$128,683,820
2009	SBIR	Phase 2	645	261	40.5%	\$158,314,879
2009	STTR	Fast Track	47	7	14.9%	\$1,122,592
2009	STTR	Phase 1	535	104	19.4%	\$19,495,058
2009	STTR	Phase 2	105	32	30.5%	\$16,243,872
2009	FY TOTAL		4,529	1,108	24.5%	\$339,594,601
2010	SBIR	Fast Track	430	67	15.6%	\$16,795,150
2010	SBIR	Phase 1	4,496	614	13.7%	\$129,218,371
2010	SBIR	Phase 2	734	246	33.5%	\$146,228,959
2010	STTR	Fast Track	47	11	23.4%	\$2,300,971
2010	STTR	Phase 1	539	109	20.2%	\$21,620,399
2010	STTR	Phase 2	92	32	34.8%	\$18,207,113
2010	FY TOTAL		6,338	1,079	17.0%	\$334,370,963

Defined as R43, R44, U43 and U44 activity codes
Defined as R41 and R42 activity codes

NIH mechanism that expedites the decision and award of SBIR and STTR Phase II funding for scientifically meritorious applications that have a high potential for commercialization.

Award level used to establish the technical/scientific merit and feasibility of the proposed R/R&D efforts. SBIR Phase I awards normally may not exceed \$150,000 total (direct costs, facilities and administrative (F&A)/indirect costs, and fee) for a period normally not to exceed 6 months. STTR Phase I awards normally may not exceed \$100,000 total for a period of 1 year.

Award level used to continue the research or R&D efforts initiated in Phase I. Funding shall be based on the results of Phase I and the scientific and technical merit and commercial potential of the Phase II application. SBIR Phase II awards normally may not exceed \$1,000,000 and STTR Phase II awards normally may not exceed \$750,000 total (direct costs, F&A/indirect costs, and fee) for a period normally not to exceed 2 years.
See Success Rate Definition Worksheet

⁴Success Rates

4.1 11.4

5.9 18.3

¹Total Funding

Total funding is the funding for each fiscal year, and not for the life of the project. Includes only awards made with Direct Budget Authority funds, and excludes Superfund Budget Authority.

*Due to the application of more refined analysis techniques, some pre-2009 data previously published has been updated in this table.

** NOTE: The success rates shown here include only applications received in response to non-ARRA funding opportunity announcements (FOAs). Some of these applications, however, were awarded with ARRA funds through extensions of the pay-line. As a result, the denominator for the success rate includes all non-ARRA applications and the numerator only includes awards made with non-ARRA funds. Applications awarded with ARRA funds through extensions of the pay-line are reported in a separate table as an award count, not as part of a success rate. Success rates for applications received in response to ARRA FOAs are also reported in a separate table.

*** NOTE: The Effective SGR rate should actually be calculated with a one-year offset lag between Phase I Applications and Phase II Awards to reflect the approximate one-year delay between Phase I award and Phase II down-select. This calculation is approximate based on the data provided.

Appendix P

Overview of the History of Venture Capital Participation in the SBIR Program

The question of venture capital participation is as it relates to the SBIR law is not about financing, it is about ownership and control. Since the beginning of SBIR, eligibility for SBIR was defined as a for-profit business concern, with more than 500 employees and affiliates that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States.

Some firms which did not meet the criteria did apply for and win awards. The reasons for this include the firm not knowing or understanding the rules concerning ownership by individuals, lax agency oversight, or possibly fraud.

As a result of a protest of an award to a company that had venture capital funding, the SBA Office of Hearings and Appeals issued an opinion in January, 2001, that the term "individuals" in reference to ownership and control of an SBIR firms only applied to "natural persons," and not an "artificial person," such as a venture capital fund or corporation.

"The SBA's Small Business Size Regulations establish small business eligibility criteria for receiving awards under the SBIR Program (13 CFR 121.701–121.703). Section 121.702(a) states that to be eligible to compete for award of an SBIR funding agreement, a business concern must "(b) at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States;..."

"SBIR Program managers at participating agencies will often receive a proposal from a concern that is owned by another concern. The concern's size, together with its parent company, will often be below the 500 employee small business size standard for an award, while its parent is at least 51% owned and controlled by one or more U.S. citizens or permanent resident aliens. However, because it is more than 50% owned by this other concern, it is ineligible for an SBIR award. Consequently, potential SBIR awards go unawarded because there may be no other meritorious and feasible proposals from qualified concerns, and the innovations of otherwise eligible small business concerns go unfunded." (13 CFR 121.701–121.703). Section 121.702(a))

In April 2003, the SBA applied this ruling to a biotechnology company, holding that the firm did not meet the SBIR size standard because it had venture capital investment in excess of 50 percent. This ruling clarified the participation of venture capital firms based on the requirements for eligibility in SBIR.

The issue prompted numerous comments on the issue of ownership and the SBA released a request for input on new regulations in 2003 titled "Participation of Businesses Majority-Owned by Venture Capital Companies in the SBIR Program" (Federal Register, 68 FR 33412). Numerous responses were received for and against the participation of VC controlled firms. As a result, the SBA examined the issue of VC ownership and changes

the regulation to include VC controlled firms that could meet the 500 person affiliation requirement. In this document, the SBA stated SBIR eligibility requirements as follows:

"Under current regulations (Sec. 121.103, "What is affiliation?"), when VCCs have control of a firm in which they invest, they are considered affiliated with that firm, just as any other business entity would be if it had ownership or control."

"The size standard for the SBIR Program requires that an eligible small business concern, with its affiliates, have no more than 500 employees. The proposed rule did not propose to change this 500 employee size standard for the SBIR Program. "

"It (the small business) must either be a for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States "

"SBA's general principles of affiliation provide that concerns are affiliates of one another when one concern controls or has the power to control the other, or a third party (or parties) controls or has the power to control both. The power to control need not be exercised; it need only be present. More than 50% ownership of a concern by another will always create affiliation (with certain exceptions, summarized in the next paragraph). Affiliation may also exist if there is less than 50% ownership of a concern by another. In these situations, SBA will also consider factors such as management, previous relationships, shared business or economic interests, economic dependence, convertible debentures, agreements to merge, etc., in determining when affiliation exists in a given situation. The regulations have been developed over many years to provide guidance to the public on how SBA evaluates affiliation. Because relationships among business concerns can be extremely complicated and at times difficult to fully discover, the affiliation regulations are more extensive than other size regulations."

As a result of the reevaluation of the SBIR regulations, the SBA promulgated the following new regulation which clarified the ownership issue permitting venture capital control if and only all affiliates of the small firm and the venture capital firm did not exceed 500 persons.

13 CFR Part 121, RIN: 3245-AE76

Small Business Size Regulations; Small Business Innovation Research Program.

AGENCY: U.S. Small Business Administration (SBA).

ACTION: Final rule.

PUBLISHED: Federal Register / Vol. 69, No. 232 / Friday, December 3, 2004 / Rules and Regulations

SUMMARY: The U.S. Small Business Administration (SBA or Agency) is revising its small business size regulations regarding ownership and control of Small Business Innovation Research (SBIR) Program awardees.

The final rule provides that an SBIR awardee must meet the following requirements: (1) it must be a for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States (as the regulations currently require); or (2) it must be a for-profit business concern that is at least 51% owned and controlled by another for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States. This rule does not change the size standard requiring that an SBIR awardee, together with its affiliates, have no more than 500 employees. Because SBA received a large number of comments concerning ownership of SBIR Program participants by Venture Capital Companies, SBA will issue an Advanced Notice of Proposed Rulemaking seeking additional information this issue.

As a result the SBA created a new policy that 1) Venture capital firms were individuals, 2) When a small business that had venture capital funding of less than 50% the small business was eligible without restriction. 3) When a small business that was owned and controlled by a venture capital firm but with a total number of affiliates was under 500 persons the small business was eligible without restriction. 4) Only when a small business that was owned and controlled by a venture capital firm had a total number of affiliates was over 500 persons was the small business ineligible the small business was eligible for SNIR funding. As a result of this decision, small businesses with majority ownership by venture capital firm which met the affiliation requirement became legally eligible for SBIR funding.

The issue of affiliation for venture capital controlled firms with more than 500 affiliates became a major point of contention between the privately owned small firms and SBTC, on one side and BIO and NVCA representing small businesses controlled by venture capital companies where the small businesses did not meet the 500 person affiliation requirement on the other.

Because of this the SBIR legislation was delayed for almost three years with 10 continuing resolutions while Congress and the small business community wrangled over the issue of venture capital participation. After years of much debate and negotiation, a compromise was reached. This has been now resolved to satisfaction of all parties involved including Small Business technology Council (SBTC), the Biotechnology Industry Organization (BIO), and the National Venture Capital Association (NVCA), US Chamber of Commerce, the National Defense Industrial Association (NDIA), NABA, the New England Innovation Alliance (NEIA), the Bay Area Innovation Alliance (BAIA), Calif. SB, that is embodied in the bipartisan Senate Bill S.493 - SBIR/STTR Reauthorization Act of 2011.

Under the new provisions in the bill, small businesses that are owned by venture capital firms which do not meet the 500 person affiliation requirement, which all other firms participating in the SBIR program must meet to participate, this requirement is waived and they are eligible for 25% of NIH and NSF SBIR funding and 15 % of SBIR funding from other agencies.

With this provision, all small businesses with venture capital funding will be allowed to participate in SBIR with the only restriction being that those which do not meet the 500 person affiliation requirement may participate to a somewhat limited extent.

Appendix Q

National Research Council Finds Multiple SBIR Award Winners Are Not a Problem

An Assessment of the SBIR Program

Sec. 5.9.6 Multiple-Award Winners

Multiple-award winners do not appear to constitute a problem for the SBIR program at any agency. At all agencies except DoD, only a limited number of companies win a sufficiently large number of awards to meet even the loosest definition of a “mill.”

Even at DoD, we find arguments aimed at limiting a company’s participation in SBIR to be unconvincing, for a number of reasons:

- (1) **Successful Commercialization.** Aggregate data from the DoD commercialization database indicates that the basic charge against “mills,” i.e., no commercialization, is simply incorrect. Companies winning the most awards are on average more successful commercializers than those winning fewer awards.
 - While data from this source are not comprehensive, they do cover the vast majority of MAWs—and the data indicate that on average, firms with the largest number of awards commercialize as much or more than all other groups of awardees; that in the aggregate, there is no MAW problem of companies living off SBIR awards.
- (2) For some multiple winners, at least, even though they continue to win a considerable number of awards, the contribution of SBIR to overall revenues has declined.
- (3) Case studies show that some of the most prolific award winners have successfully commercialized, and have also in other ways met the needs of sponsoring agencies.
- (4) **Graduation.** Some of the biggest Phase II winners have graduated from the program either by growing beyond the 500-employee limit or by being acquired—in the case of Foster-Miller, for example, by a foreign-owned firm. Legislating to solve a problem with companies that are in any event no longer eligible seems inappropriate.
- (5) **Contract Research.** This can be valuable in and of itself. Agency staff indicate that SBIR fills multiple needs, many of which do not show up in sales data. For example, efficient probes of the technological frontier, conducted on time, on budget, to effectively test technical hypotheses, may save extensive time and resources later, according to agency staff.
- (6) **Spin-offs** Some MAWs spin off companies—like Optical Sciences, Creare, and Luna. Creating new firms can be a valuable contribution.
- (7) **Valuable Outputs.** Some MAWs have provided the highly efficient and flexible capabilities needed to solve pressing problems rapidly.
- (8) **Compared to What?** Agency programs do not impose limits. It is hard to see why small businesses should be subjected to limits on the number of awards annually when successful universities and prime contractors are not subject to such limits.

All these points suggest that while there have been companies that depend on SBIR as their primary source of revenue for a considerable period to time, and there are some who fail to develop commercial results, the evidence strongly supports the conclusion that there is no multiple winner problem. Moreover, those who advocate a limit on the annual number of awards to a given

company should explain how this limit is to be addressed across multiple agencies, and why technologies that may be important and unique to a given company should be excluded on this basis.

Given that SBIR awards meet multiple agency needs and multiple congressional objectives, it is difficult to see how the program might be enhanced by the imposition of an arbitrary limit on the number of applications per year, as is currently the case at NSF. However, if agencies continue to see issues in this area, they should consider adopting some version of the DoD “enhanced surveillance” model, in which multiple winners are subject to enhanced scrutiny in the context of the award process.

National Research Council of the Academies, The Small Business Innovation Research Program: An Assessment of the SBIR Program. : The National Academies Press, Washington, DC, Sect. 5.9.6, pages 220-222, (2008)

Chairman GRAVES. Absolutely.

Dr. SQUILLANTE. Thank you. It came to my attention we left out one of the addenda. I will gladly answer any questions.

Chairman GRAVES. I will next introduce Amy Comstock Rick. Ms. Rick is the chief executive officer of Parkinson's Action Network. Before joining PAN in 2003 she served as director of the U.S. Office of Government Ethics, having accepted the nomination to the Senate-confirmed position in 1999. Prior to her appointment to the Office of Government Ethics, Ms. Rick was associate counsel to the president in the White House Counsel's Office. Ms. Rick began her federal service as an attorney at the U.S. Department of Education in 1988 and she entered her tenure there in 1998 as assistant general counsel for ethics. Thanks for coming today.

STATEMENT OF AMY COMSTOCK RICK

Ms. RICK. Thank you, Chairman Graves and ranking member Velázquez and other members for inviting me to testify on behalf of PAN, the Parkinson's Action Network regarding SBIR.

PAN represents the entire Parkinson's community, including the more than one million Americans who currently have the disease, the estimated 60,000 who are newly diagnosed each year, their families, and in fact, all the national Parkinson's organizations. So it is on behalf of that entire community that I am here today.

Parkinson's disease for those who are not familiar is a chronic, progressive, neurological disease that results from degeneration and premature death of the dopamine-producing neurons in the brain. It is the second most common neurological disease, second only to Alzheimer's. The cause of Parkinson's is unknown, although current research leads to a combination of genetic and environmental factors. Parkinson's is currently without any known cure and we have nothing that slows the progression of the disease. As Parkinson's progresses even with treatment, substantial disability, including the inability to maintain balance, walk, speech, and movement is inevitable. The symptomatic treatments that we do have work well for five to eight years but they lose their effectiveness and have their own debilitating side effects.

I am here today because PAN, like many patient advocacy organizations, strongly supports the SBIR program. As you would expect, we are most familiar with the program as it operates at the National Institutes of Health or NIH.

To understand why the SBIR program is so important it is helpful to understand how biomedical research is conducted. The therapy development process takes many years from beginning to end. For neurological diseases like Parkinson's, the process can take 15 years after the time that a basic discovery is made. At the beginning of this process, at the very beginning of this pipeline you have basic research that is supported by NIH and at the end one hopes you have a drug biologic or treatment approved by the FDA that is available to the public. But it is the middle of this process that we have already alluded to the valley of death where we take knowledge from basic research and pursue its therapeutic potential. And this is where problems can occur.

This phase of research is called translational research and is some of the most difficult and costly research needed to develop

therapies that meet a very real public health need. It includes developing pre-human testing, efficacy trials, production design, and a range of other steps needed to determine whether a therapy will be effective and, of course, safe. Unfortunately, many basic discoveries get lost or are not pursued in this translational phase because they lack the funding, professional incentives, and technical expertise needed to advance further. It is disconcerting for people living with Parkinson's disease and other untreated or undertreated conditions to know that many potential therapies or disease-understanding breakthroughs are not pursued to ascertain if they have any therapeutic potential because there is not enough funding. And this is where SBIR comes in.

SBIR grants have a significant role to play in the arena of translational research. In 2010, NIH awarded \$616 million in SBIR grants to hundreds of small companies around the country. NIH SBIR grants are awarded to small companies that can bridge that divide between basic discovery and the hard, very hard work of testing that discovery for its therapeutic potential.

Historically, these small companies have raised their needed capital from private investors but in recent years we have seen a dramatic and harmful shift away from the investment of private funds in biomedical research. Biomedical research takes a very long time. The return on investment may not simply be soon enough for investors and also for a disease like Parkinson's and many other complicated diseases there is a lack of appeal quite honestly to private investors because the potential market for the therapy, one million people, may not be blockbuster in size and there is greater risk involved in testing therapies for diseases of the brain. Without SBIR funding, many of these small companies pursuing one or two projects at a time would simply not exist and some very promising research efforts would not be pursued. That is why when you look at the SBIR program from a patient perspective the program is not just about funding small companies. It is about pursuing possible treatments for many diseases and all the societal benefits including economic that come with that.

I also want to offer our thoughts on the longstanding issue of whether to allow minority, I am sorry, majority venture capital-owned firms in the SBIR program. It does not seem logical that we eliminate from eligibility small businesses with research projects that otherwise merit public funding just because of the financial structure of the small company. In fact, venture capital dollars are often the only source of private capital that is willing to fund long-term risky biotech start-up companies and the reason becomes even more confounding when one focuses on the fact that the companies that are being excluded by the existing—and I hope the compromise goes through—but the existing SBA rule are the very ones that are doing work that is good enough to have attracted venture capital money even in this very challenging financial climate. The very companies that are doing a good enough job in one area are, because of that success, barred from federal support for other promising research. This policy does not just penalize companies, it penalizes patients.

PAN supports the Committee's efforts to move the SBIR reauthorization legislation expeditiously through the House and have a

bill that can be signed into law before the next reauthorization deadline of May 31, 2011. And thank you again for this opportunity to provide testimony to this Committee.
[The statement of Ms. Rick follows:]

Testimony of the Honorable Amy Comstock Rick, J.D.
Chief Executive Officer
Parkinson's Action Network
Washington, DC

For the U.S. House of Representatives
Committee on Small Business
Hearing on "Spurring Innovation and Job Creation: The SBIR Program"

March 16, 2011

Thank you, Chairman Graves and Ranking Member Velázquez for inviting me to testify on behalf of the Parkinson's Action Network regarding the Small Business Innovation Research (SBIR) program. As you know, I am the Chief Executive Officer of the Parkinson's Action Network, also known by our acronym, PAN.

PAN represents the entire Parkinson's community, including the more than one million Americans currently fighting Parkinson's disease (PD), the estimated 60,000 newly diagnosed every year, and their families, and all the national Parkinson's organizations, including The Michael J. Fox Foundation for Parkinson's Research, Parkinson's Disease Foundation, National Parkinson Foundation, Parkinson Alliance, and American Parkinson Disease Association.

Parkinson's disease is a chronic, progressive neurological disorder that results from degeneration and premature death of dopamine-producing brain cells. It is the second-most common neurodegenerative disease in the United States, after Alzheimer's. The cause of PD is unknown, although research points to a combination of genetic and environmental factors. PD is currently without any known cure.

Parkinson's patients experience devastating physical and mental symptoms such as tremors, debilitating slow movements, postural instability (balance problems), sleep disturbances, and a variety of cognitive impairments. Unfortunately, today's treatment options provide only some symptomatic relief; there are currently no treatments that halt or reverse the progression of the disease. Current state-of-the-art treatment for people with Parkinson's disease is rooted in levodopa and its derivatives. Levodopa was approved more than 40 years ago and, sadly, is still the primary treatment for Parkinson's. Levodopa and the derivatives only treat the symptoms of the disease and are only effective in treating symptoms for a limited period of time. There is nothing that will actually slow the progression of Parkinson's or that will ward off ultimate and complete disability.

As Parkinson's progresses, even with treatment, substantial disability – including the inability to maintain balance, walk, speak, and move – is inevitable and makes assisted living and nursing home care necessary. Parkinson's disease sufferers are desperately awaiting an innovative neuroprotective treatment that will relieve their pain and halt the disease.

I am here today because PAN, like many patient advocacy organizations, strongly supports the Small Business Innovation Research (SBIR) program. At PAN, we are most familiar with SBIR as it operates at the National Institutes of Health (NIH). As you may know, NIH is the single largest source of Parkinson's disease research funding in the world.

To understand why the SBIR program is so important, it is helpful to understand something very fundamental about how medical research is conducted: The basic scientific discoveries coming out of NIH are very important; but it is also important to "translate" those basic scientific discoveries into therapies for people living with diseases. Let me say that again: both basic scientific research AND the research needed to translate those discoveries into new drugs and therapies are crucial.

The drug development process takes many years from beginning to end – for neurological diseases like Parkinson's, the process can take 15 years or more. At the beginning of this process you have basic research supported by NIH. At the end, one hopes, you have a drug, biologic, or treatment, approved by the FDA, that is available to those afflicted with a particular disease. Unfortunately, between these two bookends of well-understood areas of federal oversight, you have a process that is often-times confusing and inefficient; promising discoveries can be lost because no one is ensuring that they are "translated" or carried through to test their therapeutic potential. This place where basic discoveries often languish is referred to as the "Valley of Death."

It is disconcerting for people living with Parkinson's and other untreated or under-treated conditions to know that many potential therapies or disease-understanding breakthroughs are lost in the "Valley of Death" simply because there is not enough funding to move basic research to product development. This translational science is some of the most difficult and costly research needed to develop therapies and meet the public health need, including developing pre-human testing, efficacy trials, production design and a range of other steps needed to determine whether a drug will be safe and effective. It is also essential for reducing the burden of disease and disability for millions of Americans.

This is where SBIR grants come in. SBIR grants have a significant role to play in the drug development arena. In FY2010, NIH awarded \$616 million in SBIR grants to hundreds of small businesses across the country. NIH SBIR grants are awarded to small companies that can bridge the divide between a basic discovery from which we may have learned more about a disease and the hard work of testing that discovery for its commercial and, from my perspective, therapeutic potential. Most often it is the small start-up biotech companies that are the true innovators of medical cures and treatments.

Historically, these small companies have raised their needed capital from private investors. But, in recent years we have seen a dramatic and harmful shift away from investment funds in biomedical research. The lack of appeal to investors may occur for a number of reasons – biomedical research takes a very long time so the return on investment may not be soon enough. Also, for a disease like Parkinson's the lack of

appeal to private investors may be because of the size of the potential market and ultimately profit (we are only one million or so in this country) and the greater risk involved with testing therapies for a disease of the brain.

The SBIR program supports and is focused on cutting-edge research where other sources of research are difficult, if not impossible, to obtain. And the SBIR grants, though relatively small, can make all the difference in whether that cutting-edge research is pursued or not. SBIR will provide Phase I funding of up to \$150,000 for six months to examine the technical merit, feasibility, and potential for commercialization of the proposed research effort. A meritorious project can then get Phase II funding of up to \$1,000,000 in total costs for two years to continue the research and development project.

I am certain that without SBIR funding, many of these small companies pursuing only one or two projects at a time, would simply not exist and some very promising research efforts would not be pursued. That is why, when you look at the SBIR program from a patient perspective, this program is not just about funding, it is about pursuing possible treatments and cures for many diseases.

I cannot emphasize to you enough how troubling it is to a person with Parkinson's or their loved one that there are potentially hundreds of bright ideas out there for better treatments for Parkinson's disease that are not being pursued because our system does not have a process for ensuring that good ideas are not lost. In fact, in a perfect world there should be a way of ensuring that promising ideas move through the pipeline as quickly as the science dictates and the potential benefit to the public health demands. But this is not the case. There is no guarantee that a promising therapy for a disease with a very small population, for example, will move through the pipeline at all. Similarly, there is no guarantee that a risky idea even for a disease that affects a larger population, let's say Alzheimer's Disease, with a population over 5 million and growing, will be pursued.

I also want to offer our thoughts on the long-standing issue of whether to allow majority venture capital owned firms in the SBIR program. After the 2003 SBA ruling regarding SBIR eligibility based on majority ownership by "individuals," there was a precipitous drop in applications to the NIH SBIR. Given the increase in most applications to NIH, it is fair to assume that the drop was a direct result of the eligibility ruling.

From a patient perspective it does not seem logical, and is in fact scary, that we eliminate from eligibility research projects that otherwise merit funding, because of the financial structure of the small company. In fact, venture capital dollars are often the only source of capital that is willing to fund long-term risky biotech start-ups companies. And, the reasoning becomes even more frightening when one focuses on the fact that the companies that are being excluded by the SBA rule are the very ones that are doing work that is good enough, for whatever reason, to have attracted venture capital money even in this very challenging financial climate. The very companies that are doing a good enough job in one area are, because of that success, barred from federal support for other promising research. This policy doesn't just penalize companies, it penalizes patients.

By eliminating a large percentage of private, innovative researchers, we are left with a much smaller pool of applicants from which NIH can draw when funding these grants. It just seems logical to me that we would want to do everything we could to invite as many applications as possible into that peer-review process so we are assured that what comes out is the best science, with the most promise, that we can fund.

Small companies have always been a vital piece of innovative biomedical research and advances in the country. Small companies conduct so much of the critical translational research that needs to be done in the “Valley of Death” – the middle of that development pipeline between NIH basic science on the front-end and drug development by big pharmaceutical companies on the back end. And the SBIR program is critical to helping those small companies play their key role in developing the new drugs and therapies of tomorrow.

As PAN continues working toward better treatments and cures for millions of Americans, we respectfully seek the Small Business Committee’s support for a robust SBIR program at NIH. SBIR is an essential program that provides key funding for patient-oriented research currently languishing in the “Valley of Death” of the biomedical research system. We respectfully request that your support include a revision so that small companies are not eliminated based on their financial structure.

PAN supports the Committee’s efforts to move SBIR Reauthorization legislation expeditiously through the House and a bill can get signed into law before the next reauthorization deadline of May 31, 2011.

Thank you again for this opportunity to provide testimony. I look forward to working with the Committee on this critical issue for the Parkinson’s community, the small business community, and all American families facing disease and disability.

Chairman GRAVES. Thank you all very much. And I apologize to everybody here for the inconvenience of the vote. There is just one vote so we will go over and vote and come right back. And we will be in recess for just a short time.

[Recess]

Chairman GRAVES. We will call the hearing back to order and we will get started with questions here and hopefully we will have some of our members return as we go through it.

My question is really for each of you. I will start with Mr. Tullie. And I always ask the question on how, you know, particularly in a lot of these programs through the SBA, how you found out about it. And Mr. Tullie, you can speak specifically to that. Some of you have members obviously you can speak to or what your experience is talking to other folks but I would very much be curious on either how you learned about the program or how, others did or, you know, what we can do to improve that obviously. Mr. Tullie.

Mr. TULLIE. This was the first time any of the founders went through the process so we were not really quite sure how to go and get it done. We just knew we had to do a lot of things and it was tough to get financing right now and we needed to look for alternate ways to get funding. We actually went and hired a consultant that had done this before and paid him \$5,000. He went out and searched the different agencies that would be applicable for us and he came up with the EPA and the National Science Foundation. And then we just went through the process.

Chairman GRAVES. Dr. Audretsch.

Dr. AUDRETSCH. Yeah, I had accepted a job at Indiana University about 12–13 years ago. When I arrived on campus the vice president for External Research, Jeff Alberts, wanted to meet me and I thought he would ask me how was the move and the schools. I could not get him to shut up about what he kept talking about, the SBIR thing. He is a psychology professor. He tests—he makes cages for animals that they now do up in the space shuttle and space station and so on. And in order to do his research at NASA he was told he had to start a company. He started the SBIR and he just had received phase two funding. And he subsequently employed, I do not know, dozens and dozens of people. And it was really hearing him was what keyed me how important the SBIR is because it is making entrepreneurs out of very capable scientists and engineers, really changing their career trajectories.

Chairman GRAVES. Dr. Squillante.

Dr. SQUILLANTE. RMD has been involved in the program since the very beginning of the program. The company was founded in 1974. To answer the question, I remember a conversation when the president of the company came to me and said there is this new program, SBIR. Do you think we ought to participate? And we looked at it and said sure, why not. I assume we learned about it through the Commerce Business Daily in those days. No electronic communication then.

Chairman GRAVES. Yeah. Ms. Rick?

Ms. RICK. As I mentioned in my remarks, Parkinson's disease is not particularly attractive necessarily to large pharmas because the population is considered relatively small. One million people have Parkinson's and a brain disease is very complicated and high risk.

And so not just about SBIR but we have been very focused as an organization and a community on the valley of death where basic discoveries, therapeutic potential is not necessarily explored and there is not a great deal of private money. So in looking at all those challenges for our disease as well as others, you cannot help but see the SBIR program. Some companies have received SBIR grants for Parkinson's therapies but it is certainly one of the components for trying to traverse that dreadful valley of death and get something to the point where the larger pharma will pick it up and run with it.

Chairman GRAVES. Well, it is always a challenge obviously and there are some great opportunities out there for small businesses but it is always a challenge, you know, getting the information out there so that they know what opportunities are out there.

I will turn to Ms. Velázquez.

Ms. VELÁZQUEZ. Thank you, Mr. Chairman.

Ms. Rick, since the SBA eligibility determination, small business SBIR applications have decreased. Besides changing the eligibility criteria rules, what other steps can be taken to ensure that small businesses or small firms with the best science and greatest potential to provide treatment are applying for SBIR awards?

Ms. RICK. Well, in fact, the compromise that is in the Senate legislation seems appropriate to us. It is my understanding as well that applications dropped after the SBA ruling and that is not acceptable to us. We think the most important thing is to fund the most promising projects. But I think it is—I think we need to find a way to move on from the VC issue and again, the compromise seems appropriate. And rather focus on educating about SBIR. Quite frankly, I think the SBIR program fills one very important niche at NIH in terms of need for translational research but it is not the only one. And I think there is a lot that needs to be done in terms of educating about the value of translational research and promoting the value of taking basic scientific discoveries and moving them from a knowledge-based basic research mode to product development. And there is a lot of work that needs to be done there. And I think there is room, as the Chairman mentioned, for more education about the SBIR program in general and how many success stories there are from that.

Ms. VELÁZQUEZ. Thank you. Dr. Audretsch, do truly small businesses receive—really receive venture funding?

Dr. AUDRETSCH. Yes, sometimes. It is hard to generalize actually about which kinds of companies—either which kind of companies receive venture funding because the answer is, well, promising growth companies do. But they can be small, they can be new, sometimes they are actually established. Sometimes, they are old. They are big. It is hard to generalize other than these are high potential growth companies. Or conversely, it is hard to generalize where small business gets its funding. We all know about the three Fs.

Ms. VELÁZQUEZ. So if you have venture funding it does not necessarily mean that you are a large company?

Dr. AUDRETSCH. Absolutely not. Absolutely not.

Ms. VELÁZQUEZ. Dr. Squillante, according to SBA's TECH-NET databases, RMD has won 386 awards for \$152 million. This places

RMD by itself above 23 states, including Missouri, Montana, Delaware, Rhode Island, and Iowa. In fact, RMD again by itself has won more in SBIR funds than Idaho, Mississippi, Wyoming, North Dakota, South Dakota combined. In your testimony you go to great lengths to talk about the program mission when it was created and that it was intended to greatly benefit firms, a lot of firms, to provide the grants for them to move from phase one to phase two and then commercialization. So given this, do you believe that when this program was created it was intended to greatly benefit just a few companies while overlooking so many others?

Dr. SQUILLANTE. No, I do not think so. I think the program—the goals of the program are clear and I think the program is designed to support the best research that is in the interest of the agencies in the country.

And that should be a very important criteria?

Dr. SQUILLANTE. Yes.

Ms. VELÁZQUEZ. So according to your parent company's Dynacell SEC 10K filing, RMD is part of a six-company corporate conglomerate with annual revenue of \$43 million. Given that small businesses applying for SBIR do not have any revenue and are independent, what are some of the advantages that you have over these types of entrepreneurs?

Dr. SQUILLANTE. Well, I think we obviously have experience which helps. And we have six research groups. The company has grown over the years. We are doing research in high performance sensors. We have established relationships with many universities and many other small companies so when we submit proposals we submit proposals in conjunction with either university groups that have skills or equipment that we do not have or with small companies who can provide the expertise that we do not have.

Ms. VELÁZQUEZ. One of the main purposes of SBIR is to bridge the valley of death. And one important challenge that small firms have is access to capital. Dynacell, the corporation that owns you, was able to establish lines of credit totaling \$17 million. So with so many access to so much credit, why does RMD need millions of dollars worth of taxpayer provided to get those grants?

Dr. SQUILLANTE. The merger with Dynacell was 2008. Before that we were a private company. At this time Dynacell is investing money in the commercialization of products. So the SBIR is doing just what it is supposed to do. It is helping us develop new technologies, create new ideas, develop these into products. And the best part about the relationship with Dynacell is they have the means to help us avoid this valley of death by taking our technologies and commercializing them.

Ms. VELÁZQUEZ. This will provide the means for some of the SBIR firms to bring their research into commercialization.

Dr. Audretsch, under the current eligibility rules it is possible for a business with 222 employees and a net worth of \$43 million, like Dr. Squillante's company, to receive an SBIR grant. So, however, a company with five employees and only a million dollars in net worth could be ineligible for these types of grants because it is majority-owned by a venture capital company. So my question to you is does this seem like a fair and equitable system?

Dr. AUDRETSCH. No.

Ms. VELÁZQUEZ. Okay.

Dr. AUDRETSCH. And you did not ask but it also does not make economic sense. It does not make economic sense. I would not link the financial structure of a company to its eligibility for SBIR.

Ms. VELÁZQUEZ. Thank you. Mr. Chairman, I have other questions in the second round.

Chairman GRAVES. Okay. Mr. Barletta.

Mr. BARLETTA. Thank you, Mr. Chairman.

Dr. Audretsch, your testimony described how you were concerned about how SBIR awards are concentrated in certain regions of the country. Do you know what regions of the country have the highest concentration of SBIR program award recipients?

Dr. AUDRETSCH. The Bay Area.

Mr. BARLETTA. Why do you think this is the case?

Dr. AUDRETSCH. Because that is where the supply of ideas, the potential for translational research is the greatest in the country.

Mr. BARLETTA. And how do you think we can increase the number of SBIR awards outside of that region?

Dr. AUDRETSCH. I think by, and this has come up in the discussion, by increasing the information about the program is exactly what the chairman asked in his introductory remarks. I think as we get away from these very successful clusters of SBIR there is much less familiarity awareness that the program exists. So I think that there is a big opportunity to increase the participation in the SBIR simply through information, by trying to get that message out there.

Mr. BARLETTA. Thank you.

Ms. Rick, I understand that sometimes when the National Institute of Health starts doing research on one disease they find that treatments for this disease can be useful in treating others. In your opinion, how often does this occur? And how important is the SBIR operation of the National Institute of Health in finding treatments for a wide variety of diseases?

Ms. RICK. I cannot give you an accurate answer on how often a particular compound or treatment moves to another disease. In fact, NIH's primary portfolio is basic research, and in spite of the growth that it is experiencing right now into the area of translational research, I think basic research is still its primary function and 60 percent of its budget goes towards basic research. So that would be research that in the neurological area, for example, could be you learn something that is relevant to Parkinson's, Alzheimer's, MS, Huntington's. I think that the—it is fundamental though that SBIR and other translational programs continue to be promoted at NIH in order for us to be able to benefit from the basic research that NIH does fund. Our primary problem is getting discoveries, potential discoveries, bright ideas but we have got a long way to go to figure out if they are going to go anywhere. Getting them through that valley of death to a point where the larger companies are willing to pick it up. And that is exactly the role, for biomedical research, that NIH SBIR fills.

Mr. BARLETTA. Well, like you, you know, I am concerned about the dramatic shift away from private investment funds in biomedical research over the past few years. In your testimony you argue that the lack of appeal for investors may either occur be-

cause biomedical research takes a long time to complete or because the size of the potential markets for certain diseases, like Parkinson's, are too small. In addition to reauthorizing the SBIR program, what else can members of Congress do to provide incentives for private investors to invest in biomedical research?

Ms. RICK. Well, that is certainly an interesting question. There could be tax credit options, some of which I know are being discussed now. But aside from SBIR, the National Institutes of Health is going through a process right now that you may be familiar with of creating a new institute at NIH, the NCATS Institute that will consolidate the other translational research that is going on at NIH to allow for more efficient and coordinated promotion of translational research. And we hope to look at some of the hurdles that cross multiple diseases. A good example is blood brain barrier, which is significant in Parkinson's but by no means unique to Parkinson's. And I think what we need to look at—in our experience, translational research has been almost a second class form of research that—it is about product development and therapy development, not necessarily the gaining of further knowledge. And we think whatever the NIH and Congress has supported that, what we can do to promote the significance of translational research so that public dollars are used to bring ideas or therapies to the point where private can pick them up. That is really what we need to do. And NIH seems to be the most logical place to do that. So I would say support for the NIH movement that we have seen last year and this year toward promoting translational research within its current budget is very important.

Mr. BARLETTA. Thank you.

Chairman GRAVES. Ms. Chu.

Ms. CHU. Thank you, Mr. Chair.

Dr. Audretsch, one of the goals of the SBIR program is to increase the participation of minorities and disadvantaged people in the process of technological innovation, but in your testimony you talked about the fact that female participation in SBIR has increased only marginally over time and that phase two awards for women have increased only from eight percent to now 9.5 percent and also that minority participation has decreased over time. Can you say something about why this is occurring and also what we should do about this?

Dr. AUDRETSCH. No. I do not know actually why this is occurring. I think that it is an important area for research and for independent scrutiny. I think that it was not—I think this is a very important question. So the answer is no, I do not know at this point.

Now, the second one, I actually have a little insight as to what could be done from my own research of analyzing NIH, the top NIH scientists who have gotten funded over a period of time. And we see that there is a gender pattern of scientists who start companies. Males have a much higher likelihood of starting companies. So when we ask the question why do some scientists at these NIH—funding scientists start companies and others do not, gender is an important variable. However, when we control for interactions with the private sector, if they sit on boards, if they write articles with scientists in private industry that gender gap goes away.

Now, that does not tell me that would help for the SBIR but it does tell me a little bit or makes me—it suggests that interactions of scientists, engineers at universities with the private sector, that will tend to promote commercialization activities. And we see actually that gender gap disappears. Now, that is not for SBIR; that is for scientists starting companies but at least it gives me a hint.

Ms. CHU. How about with regard to the minority question?

Dr. AUDRETSCH. Oh, the minority?

Ms. CHU. How can we increase participation?

Dr. AUDRETSCH. I do not know at this point.

Ms. CHU. Okay, well on another topic, the SBIR program is generally recognized as a successful program. However, for two decades it has continued to suffer from some longstanding evaluation and monitoring issues. There have been identified problems with federal agencies assessing SBIR, including limited in ad hoc evaluation efforts, difficulty in defining and measuring SBIR goals, competing SBIR objectives, and limited electronic data collection efforts. The JO did find that SBA had taken some steps to address these challenges but we are still behind on the online database and some of the data was inconsistent. What steps could be taken to ensure that SBIR can adequately assess performance?

Dr. AUDRETSCH. I think it is to improve exactly what you were referring to in the question. To have a systematic data system where all the activities are recorded of SBIR firms, but also of the applicants. In fact, this would also go—in order to—it addresses your previous question. In order to understand the role of females and minorities in the SBIR we would need to know about the applicants who did not get funded, for example. So we need to have systematic longitudinal measurement and we need to provide access to researchers who want to address the kind of questions you just asked.

Ms. CHU. Okay. There is also a question about awards that are sometimes significantly below or above SBIR guidelines. This has raised questions about the limited availability of program funding and the merits of exceeding guidelines for award amounts. And JO found that 50 percent of NIH awards and 12 percent of DOD awards exceeded SBIR guidelines. So to what extent do very large awards help or hinder access to capital by other qualified companies?

Dr. AUDRETSCH. The National Research Council and their evaluation. But this has been echoed by most of the research I have seen on the SBIR. I think that the flexibility of the program is a great asset and it is very difficult. When you really think about the scope of the program, you know, it ranges from NIH to NSF to Department of Defense. These are very different missions by these agencies. You have got such a heterogeneous group of projects in firms so that a one size fits all approach is probably not ideal. I think the flexibility has been an asset actually. I do not think this is—I think the flexibility does not deter innovative companies or potentially innovative companies from applying for SBIR. I think it enhances the congressional goals.

Ms. CHU. Thank you.

Chairman GRAVES. Mr. West.

Mr. WEST. Thank you, Mr. Chairman, and Madam Ranking Member. Thanks, panel, for joining us here today.

And I want to kind of follow on with Ranking Member Velázquez's inquiry as far as, you know, the type of metrics that we can use for evaluative criteria because, you know, one of the things we want to see is a level-type of playing field. So what I would put out to the panel as a question is what things other than just commercialization, what are some other good evaluative criteria that kind of gives everyone that semblance of a level playing field so they can apply for these grants? Recommendations.

Mr. TULLIE. As I talked about in my testimony, apply the analysis of what I call the triple bottom line. The agencies should not just look at the companies—commercial attributes to determine if these guys are going to be successful. Are they going to drive job growth? Is there going to be some return to the taxpayers? They need to go beyond that and look for the next two bottom lines. Are they there? Is there an additional public access? Is there an additional public benefit? In my business I talk about the stimulus package because we are taking trash and turning it into cash. But there are lots of other public benefits that lots of these businesses do other than just driving jobs growth.

And then the third one that I like to use is what is the hot issue of the day that we are all wrestling with? And obviously, it is the environment. Right? You should find companies that can provide environmental benefit or other benefits that provide greater good than just pure capitalization and pure commercialization. I think those are all things that should be looked at in the process and I do not think they are looked at that much today.

Dr. SQUILLANTE. If I could respond. I think the question would be how would you find metrics to measure success? And the goals are fairly clearly stated. Stimulate technological innovation. And prior to that is doing good research and development. And that is measured by peer review publications and journals. It is measured by participating in meetings. It is measured by other researchers in the field or other developers in the field adopting the technologies that you have developed under SBIR. And those are definitely quantifiable.

Meeting federal agency needs. The question there is have any of the agencies developed the technologies? And are they supporting it for transition to the field? And that is also quantifiable. And it is an important part of the SBIR program. And hopefully support for that would be enhanced and then measurement of it is also important.

Increasing commercialization is what we have mostly been working—the community has mostly been working on in terms of quantifying it. And I think by those standards RMD has been very successful in all three of those.

The fourth issue of fostering and encouraging participation by minorities is, it is a demographics question in terms of measuring it. And I think one of the things that can be done to improve that is the FAST program (Federal and State Technology Partnership Program) and other outreach programs like that. And several years ago the NIH was very active in trying to do outreach and I think NASA has done some outreach. But I think, first of all, the people

who potentially could apply for it have to understand the program. They need help in preparing proposals and understanding what a reviewer needs to see. And the SBTC and I myself have mentored small companies to help them participate in the program. So we need to educate and reach out to these companies.

Ms. RICK. If I could just add in the biomedical area where so many promising ideas do fail, I think it is important to not use SBIR as an SBIR measurement only whether a successful product came out of this because again we would prefer that result but in the biomedical field, learning that something appeared promising and does not work and educating other researchers about that is still a lower level of success and high risk projects should be supported by SBIR.

Dr. AUDRETSCH. Mr. West, your colleague, Mr. Barletta in an earlier question raised or mentioned the example of Silicon Valley as not only the leader of SBIR awards but more importantly, the most innovative place in the world. People say, scholars say, oh, the birth of Silicon Valley came from a company named Fairchild. Fairchild failed. It never really came up with—it was a semiconductor company. It never really succeeded. But out of Fairchild, one of the founders, Gordon Moore, founded Intel and the rest is history for Intel but also for Silicon Valley. I think that illustrates exactly your point, Ms. Rick, that it certainly makes evaluating the SBIR program challenging because it is hard for me to say Fairchild was a failure. Maybe to the stockholders but not to Silicon Valley. Not to the United States.

Mr. WEST. Thank you very much. I yield back, Mr. Chairman.

Chairman GRAVES. Ms. Clarke.

Ms. CLARKE. Thank you very much, Chairman Graves and ranking member Velázquez. You know, at a time when our nation's economy is struggling to rebound, the SBIRs have played a vital role in spurring job creation and innovative—and innovation, excuse me. The district that I represent has been a beneficiary of the innovative spirit of the SBIR that the SBIR program fosters. The Bio-Signal Group, which operates out of the State University of New York Downstate Medical Center, was a recipient of the SBIR funding in fiscal year '07, '08, and '09. They have done remarkable research on parts of the brain that control different aspects of memory, such as spatial knowledge, motor skills, emotional associations.

Mr. Chairman, I would like to ask unanimous consent to enter a New York Times' article on Bio-Signal's contributions into the record.

Chairman GRAVES. Without objection.

Ms. CLARKE. Thank you.

While I am a supporter of the SBIR program, like Congressman Chu, I am concerned with the downward trend in participation amongst women in minority-owned businesses. Minority-owned businesses participation fell below 10 percent in 2004 and that trend shows no sign of turning around. So I would like to extend this conversation to the panel. And I wanted to know whether you all were aware that the program that SBA had in place to reach out to women in minority-owned businesses expired in 2005. Maybe this may have some bearing. But I would like for you to give me

a sense of what we can do to ensure that this issue is addressed in a way that has real world effect of turning these numbers around. And I am sorry. I do not have my glasses. And I would like to start with you, Ms. Comstock Rick. Excuse me.

Ms. RICK. Okay. I do not have access to particular data about minority participation in this program but I will say after spending years of working with NIH and spending a fair amount of my time at meetings with neurologists presenting their research, this is not an issue unique to SBIR. That in the scientific research field I think minority and female participation is low. So I would view that as a larger problem in the scientific world, at least in the neurological world.

Dr. SQUILLANTE. Well, I think it really is a question of making potential applicants aware of the program and then helping them with even just the basics of submitting proposals. And teach them how to work with—if you have a small company that has one or two people you almost certainly need to work with somebody at a university. And, you know, you can show someone how they go about finding people. It is fairly easy how they go at finding university people. And my experience with the universities, for the most part they want to work with other people and collaborators. So I do not think it would be hard. And I think a new company, even very small with a strong university collaborate, significantly increases the odds. So it really is teaching people who have not been in the program what the steps are to succeeding.

Ms. CLARKE. Dr. Audretsch, this was your, you know, this was something that you put out into the atmosphere so I wanted to get your feedback on it.

Dr. AUDRETSCH. Yeah, thank you. Well, I think that the overall congressional goal of enhancing American innovation, that is a wonderful opportunity. If we can increase the participation rates of these groups that have had low participation rates, the economy will be more innovative.

I do not know exactly but I would think that we have addressed this in other areas and we have seen a response. I do not think we really tried to do this at the SBIR yet so I am not pessimistic. I am optimistic. I see it as an opportunity.

Ms. CLARKE. Yeah, I mean, I just found it almost—I found it interesting that the SBA had stopped their outreach in 2004 and, you know, we saw this—

Dr. AUDRETSCH. Well, right. In fact, that may be the reason why—the part you said yourself. That may be one of the reasons why the participation rate has gone down. And like my colleague just said, I think that scientists, people at universities, are socially oriented. If there are opportunities they will engage in those opportunities. I think the potential for information, bringing people together, there is a big potential for that. It is a social process.

Ms. CLARKE. Thank you.

Mr. TULLIE. I will add to that. Now, this is the first process that I have ever gone through or any of my founders have gone through with regard to a grant writing process. And although we know technology for the last 20 or 30 years we have never done grant writing. So we had to go out and hire someone who knew how to do this and how to access the system and spend \$5,000 that per-

haps a lot of other businesses did not have available to them; that is why they are looking for money. So a novel idea might be to, as a requirement of this great grant money that you give us all, is to set up some sort of a group amongst the companies who have received these grants to aid these minority-owned businesses in the grant writing process. This way they do not have to go out and spend \$5,000 and look for someone and not even realize perhaps that it is available to them. But instead they would go on your website and see who the people are that they can talk to. A lot of them should be at universities. They probably do it for a living, but even other commercial companies should help. Let that be part of what we give back. Help new companies write these grant requests.

Ms. CLARKE. Thank you very much, Mr. Chairman. And thank you for your feedback. I yield back, Mr. Chairman.

Chairman GRAVES. Mr. Richmond.

Mr. RICHMOND. I guess—thank you Mr. Chairman and ranking member Velázquez.

I guess the first question would be to Dr. Audretsch. You talked about Silicon Valley and the concentration there. The New Orleans metropolitan area has had some awards but not very many, but we now have a concentration on entrepreneurship and innovation in New Orleans. What can cities do to push and to assist companies in applying for these awards to make it—and leverage the dollars better for local municipalities?

Dr. AUDRETSCH. Yeah, I very much appreciate that question. The answer is a lot. They are doing a lot, a lot of varied types of policies, trying to leverage the SBIR opportunities. Among other things they have, some states at least, have programs where there are program administrators who try to link up potential projects from the funding agencies with scientists and engineers to try to get a good match. And they'll actually—so they're really, they're a middle man, essentially. And they go out in the field. I have been with some of them and seen this in very interesting meetings. That is really their job to try to generate SBIR proposals. Those cities or states will also have funds. It kind of links back to the previous question. I mean, those concerns about the—about minorities and female participation rates can also be addressed at the local level, the city level, or the state level by providing funds to help, say, with the grant writing. But I think it really—that one-to-one personal contact that says here is what you can do to get funding, I think that can make a big difference.

Mr. RICHMOND. One of the things we did even with new market tax credit was to create a state piggybank to make it more advantageous to use it there. In talking to my senior senator, who is Senator Landrieu, who is pushing this, part of the concern as I understand it is the venture capital and the amount of investment that they can have for a firm to still qualify. And let us weigh that against the long-term reauthorization which is a benefit so people can strategically plan years out. The question becomes, if you weigh those against each other, what wins. And give me some of the concerns that you would have? Do you sacrifice a reauthorization for a larger percentage? And I would just be interested in your opinion on that.

Dr. AUDRETSCH. I think my colleague before in his remarks said he made a plea and said we need to move fast and reauthorize SBIR. That has got to have a high priority. I would also point out that venture capital is the—venture capital funding is by far the great exception in this country to firms large and small. To SBIR firms, as well. I would, as I stated before, there is no economic grounds for linking the financial structure of a firm to its—whether or not it is qualified for SBIR. That is my preference. But the way you asked the question is very good. I would put a priority on moving ahead with—so that companies can know and plan in the future.

Mr. RICHMOND. I appreciate that. And if anyone else wants to comment on that that is my last question, so go ahead.

Ms. RISK. I actually wanted to comment on your earlier question about what can cities do.

Mr. RICHMOND. Okay.

Ms. RISK. In our experience academic research centers around the country—Michigan, Stanford, Johns Hopkins—it varies so much in terms of the programs they have to take basic research biomedical discoveries and help their researchers get them through this valley of death. Some institutions actually have offices that are set up to help basic researchers who are not schooled in the intellectual property issues and FDA issues, the funding issues, the legal issues for transferring something from a discovery to a product. Some institutions have offices for this, some do not. But there is no reason it has to be an academic research center that does that. What that is is a smart office that is helping a basic researcher who is schooled in biomedical research figure out how to take this potential bright idea that they have and test its product potential. That could be done by a city. That could be done by a partnership in a city between private and academic research center and some public money. So I think there is opportunities to look at the successful programs around the country that are doing that and see if it can be replicated.

Mr. RICHMOND. Thank you. I appreciate that.

Dr. SQUILLANTE. If I could one very brief comment. The obvious thing people think of with states is that, they could provide extra funding for the companies. Most states probably do not have the resources to do that. Massachusetts has an organization called the Massachusetts Technology Collaborative and they do not provide funding for companies for their SBIR research. What they will do and it is small but it is significant, is that if you send them your proposal they will review it and they will edit it and they will tell you what you should change. And I have seen proposals that they have done this to that really turned them from losing proposals to winning proposals. It is an extremely inexpensive thing to do. They probably get it done with volunteers and it costs the state very little because, I mean, there has to be some administrator in this organization. And it is not officially part of his job but they do this for small companies.

Mr. RICHMOND. Mr. Chairman, thank you for allowing me to go over a few minutes and I will yield back. Thanks.

Chairman GRAVES. Ms. Velázquez.

Ms. VELÁZQUEZ. Yes. Thank you, Mr. Chairman. I have a last question if I may, Dr. Audretsch.

The Senate has proposed to allow venture firms to participate in the SBIR program but only allow them to access 25 percent of an agency's SBIR funds. Given your knowledge of the program and the way venture capital companies come to fund businesses, does it make sense to grant in a portion of the SBIR funds to those firms?

Dr. AUDRETSCH. No, I do not see an economic justification for it.

Ms. VELÁZQUEZ. What impact would designating an arbitrary percentage of award funds to venture backed companies have from small businesses and innovation?

Dr. AUDRETSCH. A negative one. How negative I cannot say but it will be negative; it will not be positive.

Ms. VELÁZQUEZ. If you were to have a percentage, how would one even develop a methodology to determine what percent should go or be allocated to these firms?

Dr. AUDRETSCH. I do not think that could be worked out.

Ms. VELÁZQUEZ. Well, Mr. Chairman, I want to thank you for this hearing. And let me just state for the record, we all want to get this reauthorization done. But if we were going to authorize this for 10, 14 years, we have got to do it right. And it has to be in a way that works and works for small firms. Otherwise, we cannot abdicate our responsibility on this committee. Thank you.

Chairman GRAVES. I would like to echo the ranking member's remarks. You know, the SBIR and STTR programs are widely recognized as the country's most important engines of innovation. This is the start of the process and we are going to work very hard to get a bill out and on the floor, the House floor in May, and then ultimately as quickly as we can get it to the president's desk so he can hopefully sign it. But I would appreciate or want to say thank you to each of our witnesses for coming and I appreciate you being here. And I would ask unanimous consent that all members have five legislative days to submit their statements and supportive materials for the record. Without objection that is so ordered and the hearing is adjourned.

[Whereupon, at 2:44 p.m., the hearing was adjourned.]

Congresswoman Yvette Clarke (NY-110)
Submitted for the Record
March 16, 2011

The New York Times

April 6, 2009
BRAIN POWER

Brain Researchers Open Door to Editing Memory

By BENEDICT CAREY

Suppose scientists could erase certain memories by tinkering with a single substance in the brain. Could make you forget a chronic fear, a traumatic loss, even a bad habit.

Researchers in Brooklyn have recently accomplished comparable feats, with a single dose of an experimental drug delivered to areas of the brain critical for holding specific types of memory, like emotional associations, spatial knowledge or motor skills.

The drug blocks the activity of a substance that the brain apparently needs to retain much of its learned information. And if enhanced, the substance could help ward off dementias and other memory problems.

So far, the research has been done only on animals. But scientists say this memory system is likely to work almost identically in people.

The discovery of such an apparently critical memory molecule, and its many potential uses, are part of the buzz surrounding a field that, in just the past few years, has made the seemingly impossible suddenly probable: neuroscience, the study of the brain.

"If this molecule is as important as it appears to be, you can see the possible implications," said Dr. Todd C. Sacktor, a 52-year-old neuroscientist who leads the team at the SUNY Downstate Medical Center, in Brooklyn, which demonstrated its effect on memory. "For trauma. For addiction, which is a learned behavior. Ultimately for improving memory and learning."

Artists and writers have led the exploration of identity, consciousness and memory for centuries. Yet even as scientists sent men to the moon and spacecraft to Saturn and submarines to the ocean floor, the instrument responsible for such feats, the human mind, remained almost entirely dark, a vast and mostly uncharted universe as mysterious as the New World was to explorers of the past.

Now neuroscience, a field that barely existed a generation ago, is racing ahead, attracting billions of dollars in new financing and throngs of researchers. The National Institutes of Health last year spent \$5.2 billion, nearly 20 percent of its total budget, on brain-related projects, according to the Society for Neuroscience.

Endowments like the Wellcome Trust and the Kavli Foundation have poured in hundreds of millions of dollars more, establishing institutes at universities around the world, including Columbia and Yale.

The influx of money, talent and technology means that scientists are at last finding real answers about the brain — and raising questions, both scientific and ethical, more quickly than anyone can answer them.

Millions of people might be tempted to erase a severely painful memory, for instance — but what if, in the process, they lost other, personally important memories that were somehow related? Would a treatment that “cleared” the learned habits of addiction only tempt people to experiment more widely?

And perhaps even more important, when scientists find a drug to strengthen memory, will everyone feel compelled to use it?

The stakes, and the wide-open opportunities possible in brain science, will only accelerate the pace of discovery.

“In this field we are merely at the foothills of an enormous mountain range,” said Dr. Eric R. Kandel, a neuroscientist at Columbia, “and unlike in other areas of science, it is still possible for an individual or small group to make important contributions, without any great expenditure or some enormous lab.”

Dr. Sacktor is one of hundreds of researchers trying to answer a question that has dumbfounded thinkers since the beginning of modern inquiry: How on earth can a clump of tissue possibly capture and store everything — poems, emotional reactions, locations of favorite bars, distant childhood scenes? The idea that experience leaves some trace in the brain goes back at least to Plato's Theaetetus metaphor of a stamp on wax, and in 1904 the German scholar Richard Semon gave that ghostly trace a name: the engram.

What could that engram actually be?

The answer, previous research suggests, is that brain cells activated by an experience keep one another on biological speed-dial, like a group of people joined in common witness of some striking event. Call on one and word quickly goes out to the larger network of cells, each apparently adding some detail, sight, sound, smell. The brain appears to retain a memory by growing thicker, or more efficient, communication lines between these cells.

The billion-dollar question is how?

In the decades since this process was described in the 1960s and 1970s, scientists have found scores of molecules that play some role in the process. But for years the field struggled to pinpoint the purpose each one serves. The problem was not that such substances were so hard to find — on the contrary.

In a 1999 paper in the journal *Nature Neuroscience*, two of the most prominent researchers in brain science, Dr. Jeff W. Lichtman and Joshua R. Sanes of **Harvard**, listed 117 molecules that were somehow involved when one cell creates a lasting speed-dial connection with a neighbor, a process known as “long-term potentiation.”

They did not see that these findings were necessarily clarifying the picture of how memories are formed. But an oddball substance right there on their own list, it turned out, had unusual properties.

A Helpful Nudge

“You know, my dad was the one who told me to look at this molecule — he was a scientist too, my dad, he’s dead now but he had these instincts — so anyway that’s how it all started,” Dr. Sacktor was saying. He was driving from his home in Yonkers to his laboratory in the East Flatbush neighborhood of Brooklyn, with three quiches and bag of bagels bouncing in the back seat. Lunch for the lab.

The father’s advice led the son, eventually, to a substance called PKMzeta. In a series of studies, Dr. Sacktor’s lab found that this molecule was present and activated in cells precisely when they were put on speed-dial by a neighboring neuron.

In fact, the PKMzeta molecules appeared to herd themselves, like Army Rangers occupying a small peninsula, into precisely the fingerlike connections among brain cells that were strengthened. And they stayed there, indefinitely, like biological sentries.

In short: PKMzeta, a wallflower in the great swimming party of chemicals that erupts when one cell stimulates another, looked as if it might be the one that kept the speed-dial function turned on.

“After that,” Dr. Sacktor said, “we began to focus solely on PKMzeta to see how critical it really was to behavior.”

Running a lab is something like fielding a weekend soccer team. Players come and go, from Europe, India, Asia, Grand Rapids. You move players around, depending on their skills. And you bring lunch, because doctoral students logging 12-hour days in a yellowing shotgun lab in East Flatbush need to eat.

“People think that state schools like ours are low-key, laid back, and they’re right, we are,” said Robert K. S. Wong, chairman of the physiology and pharmacology department at SUNY Downstate, who brought Dr. Sacktor with him from Columbia. “You have less pressure to apply for grants, and you can take more time, I think, to work out your ideas.”

To find out what, if anything, PKMzeta meant for living, breathing animals, Dr. Sacktor walked a flight downstairs to the lab of André A. Fenton, also of SUNY Downstate, who studies spatial memory in mice and rats.

Dr. Fenton had already devised a clever way to teach animals strong memories for where things are located. He teaches them to move around a small chamber to avoid a mild electric shock to their feet. Once the animals learn, they do not forget. Placed back in the chamber a day later, even a month later, they quickly remember how to avoid the shock and do so.

But when injected — directly into their brain — with a drug called ZIP that interferes with PKMzeta, they are back to square one, almost immediately. “When we first saw this happen, I had grad students throwing their hands up in the air, yelling,” Dr. Fenton said. “Well, we needed a lot more than that” one study.

They now have it. Dr. Fenton’s lab repeated the experiment, in various ways; so has a consortium of memory researchers, each using a different method. Researchers led by Yadin Dudai at the Weizmann Institute of Science in Israel found that one dose of ZIP even made rats forget a strong disgust they had developed for a taste that had made them sick — three months earlier.

A Conscience Blocker?

“This possibility of memory editing has enormous possibilities and raises huge ethical issues,” said Dr. Steven E. Hyman, a neurobiologist at Harvard. “On the one hand, you can imagine a scenario in which a person enters a setting which elicits traumatic memories, but now has a drug that weakens those memories as they come up. Or, in the case of addiction, a drug that weakens the associations that stir craving.”

Researchers have already tried to blunt painful memories and addictive urges using existing drugs; blocking PKMzeta could potentially be far more effective.

Yet any such drug, Dr. Hyman and others argue, could be misused to erase or block memories of bad behavior, even of crimes. If traumatic memories

are like malicious stalkers, then troubling memories — and a healthy dread of them — form the foundation of a moral conscience.

For those studying the biology of memory, the properties of PKMzeta promise something grander still: the prospect of retooling the engram factory itself. By 2050 more than 100 million people worldwide will have **Alzheimer's disease** or other dementias, scientists estimate, and far more will struggle with age-related memory decline.

“This is really the biggest target, and we have some ideas of how you might try to do it, for instance to get cells to make more PKMzeta,” Dr. Sacktor said. “But these are only ideas at this stage.”

A substance that improved memory would immediately raise larger social concerns, as well. “We know that people already use smart drugs and performance enhancers of all kinds, so a substance that actually improved memory could lead to an arms race,” Dr. Hyman said.

Many questions in the science remain. For instance, can PKMzeta really link a network of neurons for a lifetime? If so, how? Most molecules live for no more than weeks at a time.

And how does it work with the many other substances that appear to be important in creating a memory?

“There is not going to be one, single memory molecule, the system is just not that simple,” said Thomas J. Carew, a neuroscientist at the University of California, Irvine, and president of the Society for Neuroscience. “There are going to be many molecules involved, in different kinds of memories, all along the process of learning, storage and retrieval.”

Yet as scientists begin to climb out of the dark foothills and into the dim light, they are now poised to alter the understanding of human nature in ways artists and writers have not.

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**Testimony of Congresswoman Mazie K. Hirono
for the Committee on Small Business Hearing on the
Small Business Innovation Research Program**

March 16, 2011

Chairman Graves and Ranking Member Velazquez:

Thank you for holding this hearing on the Small Business Innovation Research (SBIR) Program.

A 2008 study by the National Research Council¹ concludes that the SBIR Program is effective in meeting congressional objectives of "increasing innovation, encouraging participation by small companies in federal R&D, providing support for small firms owned by minorities and women, and resolving research questions for mission agencies in a cost-effective manner."

I have met with many innovative companies in Hawaii that have benefited from the SBIR Program. One of these, Trex Hawaii-Advanced Materials Group located in Lihue, Kauai, recently received a 2011 Tibbetts Award. Tibbetts award winners are selected based on the economic impact of their technological innovation and on whether they have met federal research and development needs, encouraged diverse participation in technological innovation, and increased the commercialization of federal research. I am very proud of Trex Hawaii as well as a great number of other innovative firms in Hawaii that have won SBIR grants.

I've been concerned about support for innovative small businesses since last year when the House decided to end the practice of awarding earmarks to private firms. At present, the great majority of research funding goes to universities and large contractors who have had long-term relationships with federal agencies. But we know that some of the most innovative ideas come from small firms led by creative entrepreneurs. The SBIR program is very important to these firms because applying for federal grants is an expensive and time-consuming process and competing with large companies with far greater resources puts small companies at a great disadvantage.

I find it fascinating that according to data cited by one of today's witnesses, Dr. Michael R. Squillante, the average federal investment per patent issued to SBIR firms is less than 3 percent of the cost per patent issued to universities. Put another way, the SBIR program is 35 times more effective in generating patents per dollar of federal investment than are universities. Clearly the

¹ National Research Council of the National Academies, *An Assessment of the SBIR Program*. The National Academies Press: 2008.

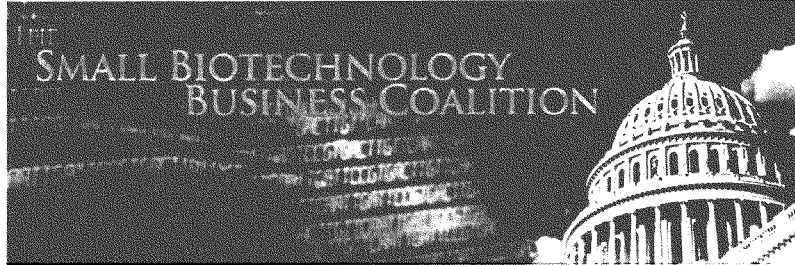
dollars invested in SBIR are generating a good return. Dr. Squillante also reports that about one-fourth of the most important technological innovations in the nation over the past decade have come from the SBIR Program (based on annual lists of the most technologically important innovations in *R&D Magazine*).

Among the recommendations in the National Research Council study are increasing the share of extramural research funding directed to the SBIR program and increasing the maximum Phase I and Phase II awards to \$150,000 for Phase I (currently \$100,000) and \$1 million for Phase II (currently \$750,000). The amount of these awards has not been adjusted since 1995.

I have introduced three bills that are in line with, although a bit more generous than, the recommendations made by the National Research Council.

- H.R. 447, the SBIR Enhancement Act of 2011, increases:
 - the share of extramural funding that goes to the SBIR program to 5 percent (currently 2.5 percent)
 - the maximum Phase I grant to \$200,000 (currently \$100,000)
 - the maximum Phase II grant to \$1.5 million (currently \$750,000)
- H.R. 449, the STTR Enhancement Act of 2011, increases
 - the share of extramural funding that goes to the STTR program to 0.6 percent (currently 0.3 percent)
 - the maximum Phase I grant to \$200,000 (currently \$100,000)
 - the maximum Phase II grant to \$1.5 million (currently \$750,000)
- H.R. 448, the Small Business Innovation Enhancement Act of 2011
 - Merges the provisions of H.R. 447 and H.R. 449.

The SBIR/STTR programs enjoy strong bipartisan support. I am hopeful that we will be able to find a path forward to reauthorize and strengthen these important programs, which will enhance America's technological leadership in the world, while generating jobs for Americans, and new products that will improve the lives of people around the world.



**AN OPEN LETTER FROM EXECUTIVES OF U.S. SMALL BIOTECHNOLOGY
& MEDICAL DEVICE COMPANIES REGARDING SBIR REAUTHORIZATION
& INCREASING THE NIH SBIR INTERNAL ALLOCATION**

Chairman Graves & Ranking Member Velazquez
House Committee on Small Business;

Chairwoman Landrieu & Ranking Member Snowe
Senate Small Business Committee;

Chairman Hall & Ranking Member Johnson
House Committee on Science, Space, & Technology;

Chairman Quayle & Ranking Member Wu
House Subcommittee on Technology & Innovation;

Dear Honorable Chairpersons & Ranking Members,

We, the undersigned leaders of small U.S. biotechnology and medical device firms write in strong support of the SBIR/STTR Reauthorization Act of 2011 (S. 493).

Today there is limited access to capital for companies developing cutting edge, early stage technologies that can cure or ameliorate disease while creating substantial numbers of new high wage jobs. The SBIR/STTR program has therefore become a primary and essential funding source for most small biotech and medical device companies throughout the country. Many important medical products now on the market were developed with funds from the SBIR/STTR program.

While we fully support this legislation we respectfully urge that the SBIR/STTR allocation at the National Institutes of Health (NIH) be increased by at least one percent for each of the next three years.

In considering our request please consider the following facts.

- For more than a decade, small business has created more than 2/3 of all new science & engineering jobs in this country and continues to sustain 38% of all science & engineering jobs nationwide. These high-paying jobs knowledge industry jobs often average \$60,000+ per year.
- Small businesses receive only about 2.8% of NIH funding (4.3% of all federal R & D funding). Academic institutions are awarded over 97% of NIH's funding, and as much as 32% of all Federal R & D.
- The number of SBIR/STTR grant applications at the NIH is at an all time high while the percentage receiving funding are at an all time low. 2010 applications increased by 40% from the prior year while the number of applications that received funding plummeted to 17.0% from 24.5% in 2009.
- Small businesses apply for 38% of new patents, 12 times more than the number of applications filed by academic institutions, and at 1/35 the cost.
- Firms receiving SBIR grants now account for nearly a quarter of *R&D 100 Awards*
- The Biomedical Research Authority of the European Union awards about 15% of their research funds to small businesses, and other countries are following suit.
- The SBIR/STTR allocation was removed from the NIH stimulus funding on the eve of passage due to behind-the-scenes lobbying by the academic community.
- Small technology companies lead translational science, transferring the majority of technology breakthroughs to the public. This translates to better medicines and better diagnostic devices that lead to a healthier society.
- The SBIR/STTR program represents a path to translate discoveries made by academic, government and non-profit institutions, funded by NIH, into valuable products and new jobs, leveraging the enormous investment in basic research.

Many of us have advanced scientific degrees and have extensive experience in working in or with nonprofit biomedical research institutions. We understand both the value

and limitations of academic research with respect to developing and commercializing innovative technologies. While academic research often serves as a foundation for our work, the true costs and risks of bringing biomedical products to market are overwhelmingly borne by companies. This reality is not reflected in the current NIH funding paradigm which provides disproportionate funding to academia.

The gross funding imbalance at the NIH—a result of persistent lobbying by the university community – hinders the ability of small companies to deliver lifesaving drugs, diagnostics and devices to patients as quickly as can be done with critical, early stage government funding. Timely delivery to the market of new products by innovative companies creates job growth in fields as diverse as manufacturing and marketing. In contrast, research projects by academia are often sustained solely with perpetual government funding

We recall that the academic lobby vigorously fought the creation of the SBIR program when it originated in the early 1980s. They argued then that the NIH in particular should devote 100% of its external funds to university based research. Over the past 30 years, SBIR funded companies have delivered hundreds of successful products to market and each year are responsible for nearly one quarter of *R&D Magazine's* list of 100 top innovations. Numerous studies by the National Academies of Sciences and others have documented the enormous success and productivity of the SBIR program which has become a global model duplicated in several other nations.

Expansion of the allocation at the NIH specifically is warranted because other agencies like DOD have an array of contract and grant programs for which companies can fairly compete. At the NIH, where funding priorities and review criteria are established by academia, companies win less than 0.1% of funds outside of the SBIR/STTR programs.

Importantly, the proposed modest increases in the SBIR/STTR allocations do not increase the Federal deficit and could be implemented without any reduction in government supported research by nonprofit entities. A mere 1% decrease in the overhead rates to all NIH grantees should permit at least a doubling of the current SBIR/STTR allocation.

In conclusion, we respectfully urge prompt reauthorization of the SBIR/STTR program with an increase in the allocation at the NIH to help us launch products that cure disease, promote human health, and create sustainable new jobs.

Sincerely,

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**Statement of
Chairman Scott Tipton
Subcommittee on Agriculture, Energy and Trade
On Wednesday, March 16, 2011
Before the House Small Business Committee hearing on
Spurring Innovation and Job Creation: The SBIR Program**

Thank you Chairman Graves and Ranking Member Velázquez for convening today's hearing. I would like to join my colleagues in welcoming our panelists as we continue to examine the SBIR program.

Generally, small businesses are better served when government gets out of the way. Having said that, the Small Business Administration does some great things to help new entrepreneurs and assist businesses that may not have been able to get up and running on their own. I believe that for the most part, the SBIR program strives to strengthen innovation and create jobs, offering a hand up, rather than a handout. This program strives to strengthen innovation and create jobs. I commend the piece of the SBIR program that targets a need and then allows for a competitive proposal process which awards a company to address this need. The success story I am most impressed by is the creation of the CDMA digital wireless technology. This process started with 35 employees but has led to jobs for over 17,000 people and revolutionized modern technology by creating a more efficient dissemination of information.

Economic recovery starts with cutting spending, addressing overregulation, and removing hurdles for small business. In the future, the Small Business Administration is going to have to tighten their belt and make some difficult decisions. To accomplish this, the SBA will have to trim bureaucracy and ensure SBA funds are going to programs that directly encourage job growth. The President has delivered a budget that continues to spend, borrow and tax at a staggering rate. The only cuts that will result from his budget will be to private sector jobs if we continue down this path. We cannot continue to engage in the runaway spending, overregulation and unsustainable entitlement programs that are driving economic uncertainty and job loss. By cutting spending and changing the way we think about budgeting, we can make significant strides toward reducing our debt, getting our economy back on track to sustain job creation and restore a predictable climate that encourages growth. We must be cognizant of this fact at all times when discussing all programs and agencies, including the SBA.

Again, Chairman Graves, thank you for holding today's hearing. I do have a few subsequent questions at this time.

**Congressman Landry
Statement- March 16, 2011**

Chairman Graves, thank you for holding this hearing on the Small Business Innovation Research program and the Small Business Technology Transfer program. Nationwide, our unemployment rate is 8.9%; although the unemployment rate in my district is below the national average, 1 in 3 people in my district work in the oil and gas industry and are being sidelined by this Administration's De Facto Moratorium. This week my friend from Colorado, Mr. Tipton, expressed his dire concerns about the unemployment rate in his state at double digits in some areas of his district. We MUST find ways to free small businesses to create jobs. The 8.9% of Americans cannot afford to be without a job for much longer. These programs are clearly ways we can help create job opportunities.

However, I am convinced there is room for improvement in anything in life, and the SBIR and STTR are no exceptions. We need to continue to closely evaluate the efficiency of these programs and be certain they are allowing individuals, small business owners, develop their ideas and spur economic growth and innovation. I look forward in earnest to the upcoming hearings our Committee will hold to reauthorize these programs. Thank you to all of

you on the panel today. Your testimonies are refreshing. You bring a real and important face to how our government can **free** businesses to flourish and foster innovation in the private sector.